

**THE BOOK WAS  
DRENCHED**

UNIVERSAL  
LIBRARY

O\_166589

UNIVERSAL  
LIBRARY



**OSMANIA UNIVERSITY LIBRARY**

Call No. 639.2 | T 39 Rf      Accession No. 25156.

Author **INDIA GOVERNMENT.**

Title **Report on the marketing of fish in India.**

This book should be returned on or before the date last marked below.





## AGRICULTURAL MARKETING IN INDIA

---

# Report on the MARKETING OF FISH IN INDIA

PUBLISHED BY THE MANAGER OF PUBLICATIONS, DELHI  
PRINTED BY THE MANAGER, GOVERNMENT OF INDIA PRESS, CALCUTTA  
1946

*Price Rs. 1-4-0 or 2s.*

**List of publications issued by the Agricultural Marketing Adviser to  
Government of India.**

SERIES NO.	NAME OF PUBLICATION.	PRICE.
1. AMA. 1 . . .	Report on the Marketing of Wheat in India . . .	Rs. 1-4-0 or 2s.
2. AMA. 2 . . .	Report on the Cold Storage and Transport of Perishable Products in Delhi . . .	As. 12 or 1s. 3d.
3. AMA. 3 . . .	Agricultural Produce (Grading and Marking) Act, 1937, with Rules made prior to 1st April 1937 (Out of print). See AMA. 17 below . . .	
4. AMA. 4 . . .	Abridged edition of the Report on the Marketing of Wheat in India in English . . .	As. 8 or 10d.
5. AMA. 5 . . .	Abridged edition of the Report on the Marketing of Wheat in India in Hindi . . .	As. 8 or 10d.
6. AMA. 6 . . .	Abridged edition of the Report on the Marketing of Wheat in India in Urdu . . .	As. 8 or 10d.
7. AMA. 7-37 . . .	Annual Report of the Agricultural Marketing Adviser and summarised reports of Senior Marketing Officers in provinces and certain States for the year ending 31st December 1937 . . .	As. 6 or 8s.
8. AMA. 8 . . .	Report on the Marketing of Linseed in India . . .	Rs. 1-4-0 or 2s.
9. AMA. 9 . . .	Report on the Marketing of Eggs in India and Burma . . .	Rs. 1-4-0 or 2s.
10. AMA. 10 . . .	Report on the Marketing of Tobacco in India and Burma (Out of print). See AMA. 38 below . . .	Rs. 1-4-0 of 2s.
11. AMA. 12 . . .	Abridged edition of the Report on the Marketing of Linseed in India in English . . .	As. 8 or 9d.
12. AMA. 17 . . .	Agricultural Produce (Grading and Marking) Act, 1937, with Rules made prior to 31st August 1940 . . .	As. 12 or 1s.
13. AMA. 18 . . .	Abridged edition of the Report on the Marketing of Linseed in India in Bengali . . .	As. 8 or 9d.
14. AMA. 14 . . .	Abridged edition of the Report on the Marketing of Linseed in India in Hindi . . .	As. 8 or 9d.
15. AMA. 15 . . .	Abridged edition of the Report on the Marketing of Linseed in India in Marathi . . .	As. 8 or 9d.
16. AMA. 16 . . .	Abridged edition of the Report on the Marketing of Linseed in India in Urdu . . .	As. 8 or 9d.
17. AMA. 7-38 . . .	Annual Report of the Agricultural Marketing Adviser and summarised reports of Senior Marketing Officers in provinces and certain States for the year ending 31st December 1938 . . .	As. 12 or 1s.
18. AMA. 19 . . .	Abridged edition of the Report on the Marketing of Eggs in India and Burma in English . . .	As. 8 or 9d.
19. AMA. 7-39 . . .	Annual Report of the Agricultural Marketing Adviser and summarised reports of Senior Marketing Officers in provinces and certain States for the year ending 31st December 1939 . . .	Rs. 1-10-0 or 2s. 6d.
20. AMA. 11 . . .	Report on the Marketing of Grapes in India and Burma . . .	Rs. 1-4-0 or 2s.
21. AMA. 18 . . .	Report on the Marketing of Coffee in India and Burma . . .	Rs. 1-4-0 or 2s.
22. AMA. 21 . . .	Report on the Marketing of Potatoes in India and Burma (Out of print). See AMA. 28 below . . .	Rs. 1-4-0 or 2s.
23. AMA. 22 . . .	Report on the Marketing of Milk in India and Burma (Out of print). See AMA. 22 below . . .	Rs. 1-4-0 or 2s.
24. AMA. 25 . . .	Preliminary guide to Indian fish, fisheries, methods of fishing and curing . . .	Rs. 1 of 1s. 6d.
25. AMA. 27 . . .	Abridged edition of the Report on the Marketing of Eggs in India and Burma in Urdu . . .	As. 8 or 9d.
26. AMA. 26 . . .	Abridged edition of the Report on the Marketing of Eggs in India and Burma in Hindi . . .	As. 8 or 9d.
27. AMA. 20 . . .	Report on the Marketing of Rice in India and Burma . . .	Rs. 1-4-0 or 2s.
28. AMA. 24 . . .	Report on the Marketing of Groundnuts in India and Burma . . .	Rs. 1-4-0 or 2s.
29. AMA. 7-40 . . .	Annual Report of the Agricultural Marketing Adviser and summarised reports of Senior Marketing Officers in provinces and certain States for the year ending 31st December 1940 . . .	Rs. 1-4-0 or 2s.
30. AMA. 28 . . .	Abridged edition of the Report on the Marketing of Potatoes in India and Burma in English . . .	As. 8 or 9d.
31. AMA. 29 . . .	Abridged edition of the Report on the Marketing of Grapes in India and Burma in English . . .	As. 8 or 9d.
32. AMA. 30 . . .	Abridged edition of the Report on the Marketing of Milk in India and Burma in English . . .	As. 8 or 9d.
33. AMA. 39 . . .	Handbook on the quality of Indian Wool . . .	As. 8 or 9s.
34. AMA. 38 . . .	Abridged edition of the Report on the Marketing of Tobacco in India and Burma in English . . .	As. 8 or 9d.
35. AMA. 31 . . .	Abridged edition of the Report on the Marketing of Groundnuts in India and Burma in English . . .	As. 8 or 9d.
36. AMA. 41 . . .	Report on the Marketing of Hides in India and Burma . . .	Rs. 1-4-0 or 2s.
37. AMA. 35 . . .	Abridged edition of the Report on the Marketing of Rice in India and Burma in English . . .	As. 8 or 9d.
38. AMA. 34 . . .	Instructions regarding the Grading and Marking of Ghee, for the Agricultural Produce (Grading and Marking) (Ghee) Rules, 1939 . . .	As. 4 or 5d.

(Continued on page 3 of the cover)

## TABLE OF CONTENTS.

	<b>PAGE.</b>
<b>Introduction</b> . . . . .	V
<b>Chapter I.—Types of fishes</b> . . . . .	1
A.—General . . . . .	1
B.—Nomenclature . . . . .	1
C.—The commercial fisheries of India . . . . .	2
<b>Chapter II.—Fishing gear and methods of fishing</b> . . . . .	6
A.—Fishing gear and the fishing industry . . . . .	6
B.—Fishing vessels . . . . .	7
(1) Description of the types of fishing vessels . . . . .	7
(a) Sea craft—	
(i) West coast . . . . .	7
(ii) East coast . . . . .	7
(b) River craft—	
(i) Rafts and dug-outs . . . . .	8
(ii) Plank-built boats . . . . .	8
(iii) Large fishing boats . . . . .	8
(2) Number and distribution of fishing vessels . . . . .	8
C.—Fishing implements . . . . .	9
D.—Note on the manufacture of nets and other fishing tackle . . . . .	10
E.—Fishing with power boats . . . . .	10
(1) Fishing with power boats in other countries . . . . .	10
(2) Use of trawlers in India . . . . .	11
(3) Possibilities of better off-shore fishing using power	
(a) Drifter trawling and seine nets . . . . .	13
(b) Development of motor boat fishing . . . . .	13
<b>Chapter III.—Supply</b> . . . . .	13
A.—Total supplies—Annual landings of fish . . . . .	13
(1) Method of survey . . . . .	13
(2) Production of fish in India . . . . .	14
(a) Sea-fish . . . . .	14
(b) Freshwater fish . . . . .	15
(3) Classification of Indian fish . . . . .	16
(a) Sea-fish . . . . .	16
(b) Freshwater fish . . . . .	16
(4) Classification according to fishing areas . . . . .	17
(a) Sea-fish . . . . .	17
(b) Freshwater fish . . . . .	17
(5) Seasonal variations in production . . . . .	17
(a) Sea-fish . . . . .	17
(b) Freshwater fish . . . . .	17
(6) Trend of production . . . . .	18
(7) Fish retained by fishermen and others for domestic consumption . . . . .	19
(8) Important centres where fish are landed or assembled . . . . .	20
B.—Imports of fish and fish products into India . . . . .	20
(1) Total quantity and value . . . . .	20
(2) Import of preserved fish, excluding canned fish . . . . .	21
(a) Trend . . . . .	21
(b) Periodicity . . . . .	21
(c) Sources . . . . .	21
(3) Canned fish . . . . .	22
(4) Cod-liver oil . . . . .	23
(5) Fish or whale oil hardened . . . . .	24
(6) Fish manures . . . . .	24

C.—Exports of fish products from India . . . . .	25
(1) Total exports . . . . .	25
(2) Exports of preserved fish . . . . .	25
(3) Fish manures . . . . .	27
D.—Re-exports of fish products from India . . . . .	27
E.—Total and net available supplies in India . . . . .	28
<b>Chapter IV.—Preparation for the market . . . . .</b>	<b>29</b>
A.—General . . . . .	29
B.—Methods employed regarding . . . . .	30
(1) Catching . . . . .	30
(2) Collecting . . . . .	30
(3) Gutting and cleaning . . . . .	30
C.—Preservation and curing of fish . . . . .	30
(1) Refrigeration . . . . .	31
(2) Canning . . . . .	31
(3) Curing . . . . .	32
(a) Sun-drying . . . . .	33
(b) Curing with salt . . . . .	34
(i) Common cure or the dry cure . . . . .	34
(ii) Wet-salting or the "Ratnagiri" method of curing . . . . .	34
(c) Smoking . . . . .	35
(d) Other Methods . . . . .	35
(i) Pickling with salt and tamarind . . . . .	35
(ii) Prawn-curing . . . . .	35
(iii) Fish pastes . . . . .	36
D.—Issue of duty-free salt for fish-curing . . . . .	36
E.—Note on number, location and size of fish-curing yards . . . . .	37
F.—Note on the manufacture of fish oils . . . . .	38
G.—Note on the manufacture of shark fins and isinglass (fish-maws) . . . . .	39
(a) Shark fins . . . . .	39
(b) Isinglass (fish-maws) . . . . .	39
H.—Suggestions for improvement in the preparation of fish for the market . . . . .	40
(1) A review of efforts made in other countries . . . . .	40
(2) The outlook for India . . . . .	40
I.—Cost of preparation for the market . . . . .	40
<b>Chapter V.—Demand and utilization . . . . .</b>	<b>42</b>
A.—Demand . . . . .	42
(1) <i>Per capita</i> consumption of fish and fish products . . . . .	42
(2) <i>Per capita</i> consumption in urban areas . . . . .	43
(3) Trend of fish consumption in India . . . . .	44
B.—Utilization of fish in India . . . . .	44
(1) General . . . . .	44
(2) Consumption as fresh fish . . . . .	45
(3) Preparation of sun-dried fish . . . . .	45
(4) Preparation of salted fish . . . . .	45
(5) Utilization as manure . . . . .	45
(6) Manufacture of other products . . . . .	46
(a) Fish-maws and shark fins . . . . .	46
(b) Canned and bottled fish . . . . .	46
(c) Fish oil . . . . .	46
(d) Fish meal . . . . .	46

(7) Demand and utilization of minor shell fish . . . . .	46
(8) Demand for by-products . . . . .	47
(a) Prawn manure . . . . .	47
(b) Shell for lime burning . . . . .	47
(c) Pit manure . . . . .	47
C.—Seasonal variations in demand . . . . .	47
(a) Sea-fish . . . . .	47
(b) Freshwater fish . . . . .	47
(c) Cured fish . . . . .	47
<b>Chapter VI.—Wholesale prices . . . . .</b>	<b>49</b>
A.—Units of sale and basis of price quotations . . . . .	49
B.—Factors affecting fish prices . . . . .	52
(1) Type of fish, its size, weight and quality . . . . .	52
(2) Fish sold to manufacturers of fish products . . . . .	53
(3) Distance between producing and consuming centres . . . . .	53
(4) Elasticity of demand . . . . .	54
C.—Wholesale prices of important varieties at the chief producing centres . . . . .	55
D.—Seasonal variations in prices . . . . .	55
E.—Trend of fish prices . . . . .	56
(1) Fresh fish . . . . .	56
(2) Foreign trade . . . . .	57
F.—Note on prices of fish fertilizers, fish oils, etc. . . . .	58
G.—Note on prices of canned and bottled fish . . . . .	58
H.—Market intelligence . . . . .	59
<b>Chapter VII.—Assembling, storage, transportation and distribution . . . . .</b>	<b>59</b>
A.—General background . . . . .	59
B.—Fishing population . . . . .	60
(1) Fishing communities . . . . .	60
(2) Numbers engaged in the industry . . . . .	60
C.—Methods and agencies of assembling . . . . .	62
(1) Fisher-folk . . . . .	62
(2) Middlemen boat-owners . . . . .	62
(3) Petty and wholesale merchants, curers and money-lenders . . . . .	63
(4) Co-operative societies . . . . .	63
(5) Cost of assembling . . . . .	64
D.—Fish markets . . . . .	64
(1) Rural markets . . . . .	65
(2) Urban markets . . . . .	65
(3) Organization and control of fish markets . . . . .	66
E.—Storage . . . . .	66
F.—Transportation . . . . .	66
(1) Transport by road . . . . .	67
(2) Transport by water . . . . .	67
(3) Transport by rail . . . . .	68
(4) Types of containers and packing materials used in the fish trade . . . . .	70
G.—Merchandising charges . . . . .	71
(1) In rural markets . . . . .	71
(2) In large assembling and distributing markets . . . . .	71
(a) Charges incurred by country dealers in consigning goods to commission agents . . . . .	71
(b) Charges of commission agents recovered from sellers for clearing the consignments and selling them off . . . . .	72

<b>H.—Distribution</b>	73
(a) Fisher-folk	73
(b) Village merchants	73
(c) Curers, commission agents and wholesale merchants	73
(d) Co-operative societies	73
(e) Retailers	73
<b>I.—Total charges incurred in the marketing of fish and price spreads from producer to consumer</b>	74
<b>J.—Finance of the fish trade</b>	74
<b>Chapter VIII.—Miscellaneous</b>	74
<b>A.—Activities of fisheries departments</b>	74
(1) Historical	74
(2) Functions	75
(a) Administrative	76
(b) Research	76
(i) Biological research	76
(ii) Technological research	77
(iii) Research into the design and equipment of fishing vessels	77
(iv) Reorganization of fisheries research	77
(c) Socio-economic and other activities	78
<b>B.—Pisciculture</b>	78
<b>C.—Propaganda</b>	79
<b>D.—Statistics</b>	80
<b>Summary</b>	80
<b>Main conclusions and recommendations</b>	83
<b>Appendices—</b>	
I.—Commercially important fishes with their scientific, popular and the more common Indian names.	88—91
II.—The chief fishing methods used in the different fishing areas in India	92—95
III.—Statement showing the quantities of sea-fish landed in the different coastal areas arranged according to varieties.	96
IV.—Table showing the estimated marketable surplus of freshwater fish in India	96
V.—Proportion of the total catch of eight economic groups of sea-fish landed along 5 strips of Indian coast-line.	97—98
VI.—Trend of production of fresh sea-fish in the west coast of Madras Province	99
VII.—Certain particulars regarding fish supply at a few important places in India	99—100
VIII.—Imports of fish products into India	101
IX.—Periodicity of imports	102
X.—Countries consigning cod-liver oil and fish manure for import into India	103
XI.—Exports of fish products from India	104
XII.—Periodicity of exports	105
XIII.—Average seasonal wholesale prices of the main groups of sea fish in the chief producing areas.	106—107
XIV.—Utilization of fish in India	108
XV.—Seasonal average wholesale prices of the main groups of freshwater fish in producing areas.	109
XVI.—Average monthly wholesale prices of salt cured fish in the important inland markets of the Madras Province.	110—111
XVII.—Average wholesale prices of the main varieties of dried fish (salted and/or unsalted) in certain areas and markets.	112
XVIII.—Monthly prices of certain economic groups of fishes in three fishing areas of the Madras Province for the year 1938.	113
XIX.—Price spreads from producer to consumer in the marketing of fish	114
XX.—Indian Fisheries Act	115—116
<b>Glossary of Indian terms</b>	116—117
<b>Maps</b>	2
<b>Diagrams</b>	8
<b>Plates</b>	43

## INTRODUCTION.

Fish, a food rich in proteins, forms a valuable addition to a diet the staple of which is rice. Although sea fishing goes on all along the coast-line, deep-sea fishing has not so far been developed in this country. Inland resources are over-fished, especially near urban areas. Scientific exploitation of sea and freshwater fisheries, intensive in the former and controlled in the latter, can very quickly and appreciably increase the total fish catch.

The future of the fishing industry is intimately connected with the question of marketing of the fish caught. This publication which is complementary to the "Preliminary guide to Indian fish, fisheries, methods of fishing and curing" (A.M.A. 25) presents, in a concise form, the chief commercial fishes of the country, where and how they are caught, their utilisation and the agencies engaged in catching and marketing the fish.

A short chapter in the Report has been devoted to the nature of fisheries research now being undertaken in the country with suggestions regarding how these activities should be co-ordinated and extended to make the fishing industry play a really significant role in solving the food problem of India.

Thanks and acknowledgments are due to a large number of fishermen, fish curers, merchants, fishery officials and others for their kind and friendly co-operation with the marketing staff and for having supplied useful data and information for this Report.

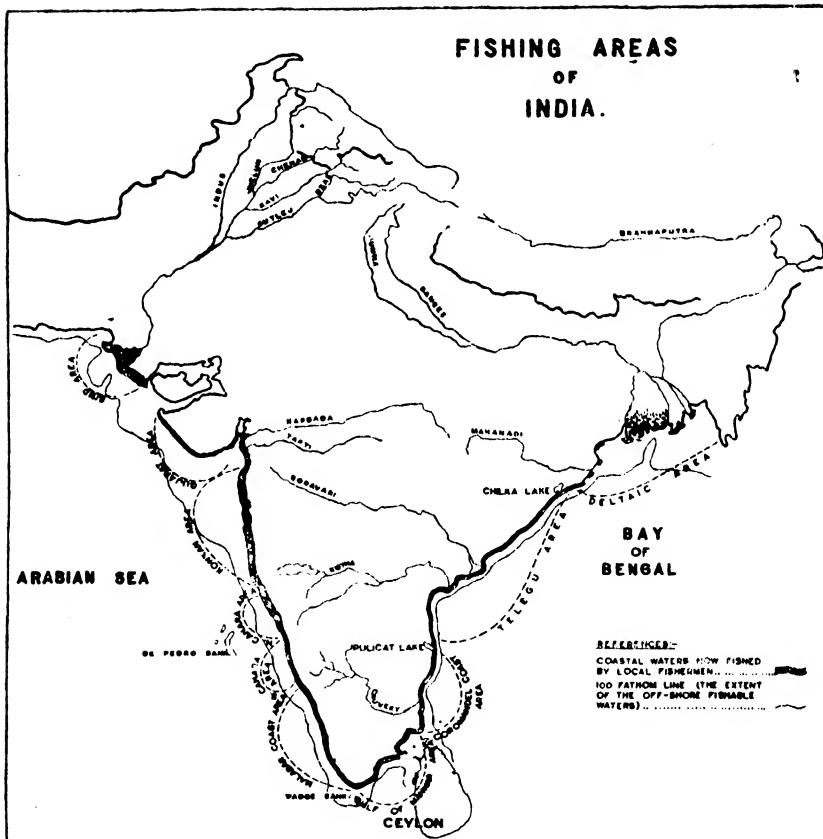
NOTE.—The Government of India should not be regarded as assuming responsibility for all or any of the materials or recommendations contained in this Report.

**THE REPORT IS SHORT AND THE WHOLE OF IT WILL BEAR READING, BUT THOSE WHO WISH TO GET A QUICKER GRASP OF THE ESSENTIAL POINTS MIGHT FIRST READ THE SUMMARY OF CHAPTERS AND THE MAIN CONCLUSIONS AND RECOMMENDATIONS AT THE END OF THE REPORT.**

**CENTRAL AGRICULTURAL MARKETING DEPARTMENT,  
GOVERNMENT OF INDIA.**

*Ajmer :  
December, 1943.*







## CHAPTER I.—TYPES OF FISHES.

### A.—General.

At present the maritime and riverine fisheries of India occupy but a minor place in the economic organization of the country. The Royal Commission on Agriculture in India noted the failure to develop the fisheries of the country as a source of food and pointed out that fish forms a specially valuable addition to a diet the staple of which is rice. The seas, estuaries and back-waters are full of a large variety of edible fish. Fishery experts in India agree that tanks, ponds and rivers are capable of maintaining large populations of edible fish and that it is merely a question of development and adequate scientific control in order that pisciculture may become an important source of food. Evidence is not wanting that a substantial percentage of the catches landed at present is allowed to go waste. Scattered fishing centres, primitive methods of capture, preservation and transport, and the inadequacy of marketing facilities are responsible for this state of affairs. Fish should be consumed in as fresh a condition as possible, or should be preserved in such a manner that its palatability and nutritive value are not seriously impaired. In India, the occupation of fishing and of dealing in fish is looked upon as a mean one, to be carried on exclusively by the lower classes. There are very few instances of men with education and capital entering the fishing industry. The result is that the fishing industry in India is essentially a cottage industry financed by a large number of petty owners and traders and worked mostly by the illiterate (but not unintelligent) section of the population. "Fisheries" has been a provincial subject since the Reform days and, so far, local Governments in India have insisted upon the Fisheries Departments paying their own way. The Royal Commission on Agriculture deprecated this attitude and recommended that a longer view should be taken of the possibilities of developing the fish resources of the country as a whole.\*

In a country of the size of India with its extensive sea-board, perennial rivers and irrigation canals, and innumerable rain-fed tanks and *jheels*, the physical and biological conditions under which fisheries exist are very varied.

### B.—Nomenclature.

Most fishes are known by different local names (Indian languages) in different parts of this country. In the markets, or in the fisherman's dialect, one name is generally applied to several species of the same genera. The specific members are not given distinct names, unless the characteristics are strikingly different. Thus there are long lists of Sindhi, Gujarati, Marathi, Canarese, Tamil, Telegu, Ooriah and Bengali names for marine fishes, and names in all important Indian languages for freshwater varieties. Fishes of different types and even of separate genera sometimes have the same vernacular name in two different areas. For instance, in Karachi the name *Rawas* is applied to jew-fishes while along the Bombay Coast it denotes the "Indian Salmon". *Rohu* is the common vernacular name for the carp *Labeo rohita* in upper India, but in H. E. H. the Nizam's Dominions the name is applied to the species *Labeo calbasu*. Two distinct vernacular names are sometimes given to the same fish in different stages of its growth. In Bengal, the name *Silun* is applied to the immature silond cat fish and *Dain* to the fully grown specimen.

Certain empirical names have become associated with the popular and more common varieties of fish. Some of these, e.g., the mackerel, the anchovy, etc., have been used to designate Indian species which are closely related to varieties found in the Atlantic and having such names. Unfortunately, even these popular English names do not always connote the same species everywhere. For instance, the name *Seer* widely applied to fishes of the *Cyprinid* group, is used to denote the *Polydromus* spp. in Karachi.

It is obvious from the above that the vernacular names or the popular English equivalents thereof cannot be wholly used in this report without the risk of confusion. Also, complete particulars regarding certain varieties found in many provinces and States are not available. The first comprehensive and systematic classification of fishes on an all-India scale was made by Francis Day in his "Fishes of India" (1876-1889) and in his two volumes on "Fishes", in the *Fauna of British India* series, and although much useful work has been done by the Fisheries Department in Madras and Zoological Survey of India, to define the characteristics of certain local types, and re-name certain species, even today, Day's names are common and are widely accepted.† In this report, therefore, the descriptions and the nomenclature adopted by Day have been adhered to. Appendix I gives these names and the vernacular equivalents in the more important Indian languages for the commercially important fishes of India.

\*Report of the Royal Commission on Agriculture in India, 1928, page 495.

†It is understood that these volumes are under revision.

## C.—The commercial fisheries of India.

Fish are caught from every piece of water in this country. The chief sources of supply are the coastal margins of the sea, river, estuaries and back-waters for marine and estuarine fish, and rivers, irrigation and other canals, lakes, tanks, inundated tracts, *jhils*, etc., for freshwater fish.

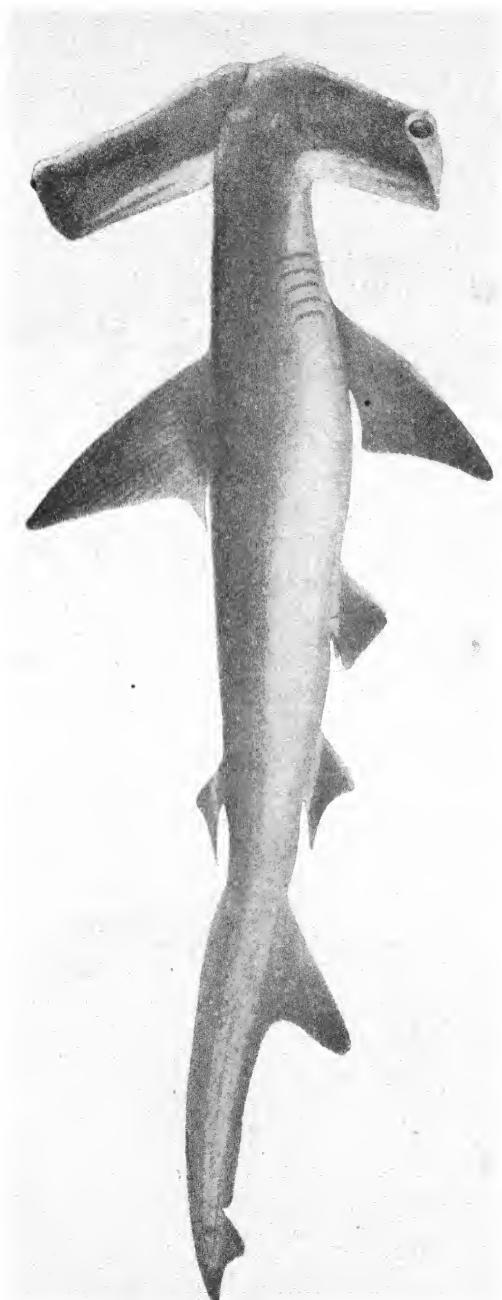
India has a coast-line of 3,220 miles exclusive of sinuosities and indentations and the total area of the sea which lies between the coast and 100-fathoms line is approximately 115,000 square miles. Only a small portion of this area is worked; there is practically no deep sea fishing, the boats are generally of the *catamaran*\* or canoe type and night fishing is not general.

The Indian rivers form extensive estuaries before they join the sea. Near the river mouth the water is brackish owing to tidal influence and several valuable species of fish and crustaceans acclimatised to changes in salinity are caught in the estuarine regions. Estuarine lagoons—generally known as back-waters which extend southwards from the mouths of all important rivers and streams and generally bounded on the seaward side by a narrow belt of sandy land—also yield several varieties of food fish. Several species of edible fish are also caught from fresh water sources all over the country. The estuarine and riverine fisheries are important as they already supply considerable quantities of fish and are free from many of the difficulties attending deep sea fishing. The supply could be increased by undertaking development measures in accordance with up-to-date methods of fish farming, but the subject is complicated owing to the habits of the fish, the customs of the country and in regard to latter, also by the nature of the rivers and the irrigational use made of them. Inland waters such as reservoirs, tanks, ponds, etc., belong to a different and simple class of fishery. But unlike in other countries, only a few of these confined waters are devoted wholly or in part to deliberate food production (pisciculture) in India.

Although the number of species of fish (*sensu stricto*) present in Indian waters is quite large, only certain types are caught in appreciable quantities. These species have been classified into 16 groups and are described in the "Preliminary guide to Indian fish, fisheries, Methods of fishing and Curing", Marketing Series No. 24, which may be referred to for details. In the table below the localities where these are chiefly caught are given:

*The chief commercial fishes of India and the localities where they are chiefly caught.*

Name of the fish.	Localities where chiefly caught.	Remarks.
<i>I. Elasmobranchs group—</i>		
(a) Sharks— (i) <i>Carcharias gangeticus</i>	Coastal waters, chiefly in the Bay of Bengal and in large tidal rivers.	69 species of cartilaginous fishes are known to exist in Indian seas (Day).
(ii) <i>Galeocerdo rayneri</i>	More common in the Arabian Sea, off Malabar and Travancore.	Liver oil is very rich in Vitamin A.
(iii) <i>Zygaena blochii</i>	Commonest shark on the West Coast. Young ones are also seen in large numbers.	Not highly esteemed as food.
(b) Saw fish— <i>Pristis cuspidatus</i>	In the seas and even high up in the larger tidal rivers.	Liver oil is very rich in Vitamin A.
(c) Skate— <i>Rhynobatus djeddensis</i>	Caught in the Bay of Bengal Coast in larger quantities.	Not highly esteemed as food.
(d) Rays— <i>Trygon sephen</i>	Common all along the West Coast during the South-West monsoon.	Ditto.
<i>II. Eels group—</i>		
(a) Marine— <i>Muraenesox talabonoides</i>	Bombay Coast.	
(b) Freshwater— <i>Anguilla bengalensis</i>	In running waters. Sometimes in paddy fields also.	30 species of eels are known to exist in Indian waters of which 20 are marine eels (Day).

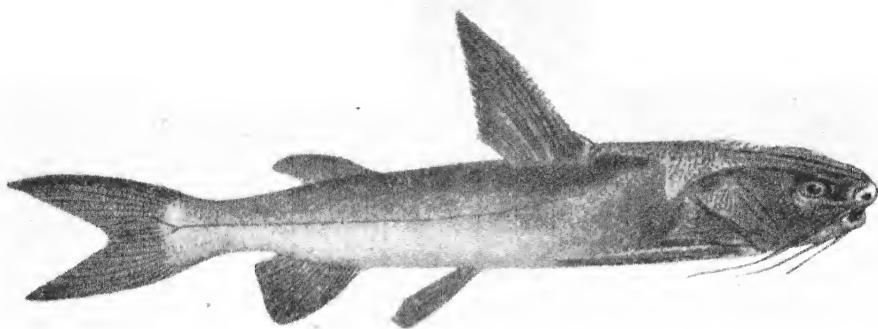


THE HAMMER-HEADED SHARK

*Zygaena blochii*

(Length up to 4 feet)

“*Fishes of India*” Do y.

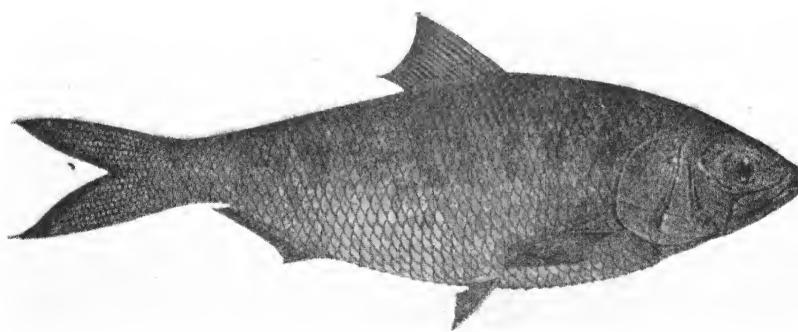


CAT-FISH

Arius sona

(Length up to 3 feet.)

"*Fishes of India*" Day.



THE HILSA FISH

Clupea ilisha

(Length up to 18 inches.)

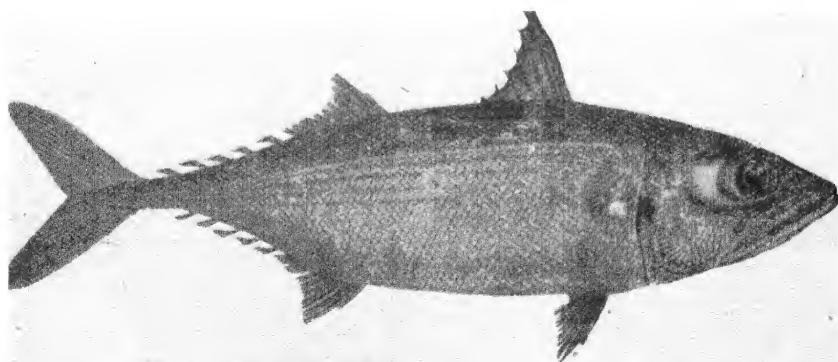
"*Fishes of India*" Day.

Name of the fish.	Localities where chiefly caught.	Remarks.
<b>III. Cat fishes group—</b>		
(a) <i>Marino</i> — (i) <i>Arius dussumieri</i> . .	Common on the West Coast appearing off Bombay during November to March and Madras during April to October.	
(ii) <i>Arius sona</i> . . . .	Bombay Coast . . . .	28 species of marine Cat fishes are known to exist in the Indian seas (Day).
(b) Freshwater— (i) <i>Wallago attu</i> . .	Adults only in the large northern Indian rivers, small specimens are seen in all fresh waters.	
(ii) <i>Bagarius yarrellii</i> . .	Only in northern Indian rivers.	
(iii) <i>Clarias magur</i> . .	In rivers, <i>jhils</i> and tanks.	
(iv) <i>Pangasius buchanani</i> . .	Only in the large northern Indian rivers.	
(v) <i>Silundia gangetica</i> . .	Only in the large northern Indian rivers.	
(vi) <i>Macrurus scenghala</i> . .	Distributed in fresh waters throughout India: large ones in river systems.	
(vii) <i>Eutropiichthys vacha</i> . .	Only in the larger northern Indian rivers.	Over 80 species of Cat fishes are known to exist in the fresh waters of India (Day).
<b>IV. Silver-bar fish group—</b>		
<i>Chirocentrus dorab</i> . .	Off Bombay coast, in the southern section of the Madras East Coast and in the Sunderbans.	
<b>V. The Herring and the Anchovies group—</b>		
(i) <i>Clupea longirostris</i> . .	South-west coast.	
(ii) <i>Clupea fimbriata</i> . .	All along the coast. In large quantities in the Bay of Bengal Coast.	
(iii) <i>Clupea ilisha</i> . .	Estuarine regions of the Indus, Sabarmati, Cauveri, Kistna, Godavari, Mahanadi and the Ganges at the time of the local floods.	
(iv) <i>Engraulis purava</i> . .	All along the coasts in varying quantities.	
(v) <i>Engraulis telara</i> . .	All along the coasts in varying quantities.	45 species of anchovies are known in Indian waters.
<b>VI. Bombay Duck group—</b>		
<i>Harpodon nehereus</i> . .	Abundant off Bombay coast and in the estuaries of Bengal.	
<b>VII. Feather-backs group—</b>		
<i>Notopterus Spp.</i> . .	In the fresh and brackish waters of India.	Two species are known of which <i>Notopterus chitala</i> is the larger.
<b>VIII. The Mackeral's and the Perches group—</b>		
(i) <i>Scomber microlepidotus</i> . .	South-west coast of India.	
(ii) <i>Cyium guttatum</i> . .	All along the coast: abundant near the estuaries of larger rivers.	
(iii) <i>Cyium commersonii</i> . .	All along the coast: abundant near the estuaries of larger rivers.	Altogether about 210 species comprising 60 mackerels and 150 perches are known to exist in the Indian seas (Day).

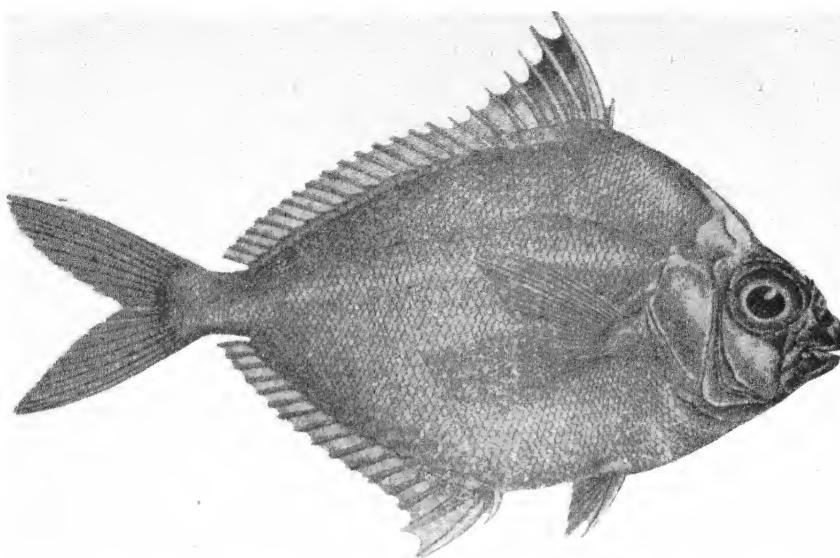
Name of the fish.	Localities where chiefly caught.	Remarks.
<i>VIII. The Mackerels and the Perches group—contd.</i>		
(iv) <i>Lates calcarifer</i> . .	All along the coast: abundant near the estuaries of larger rivers.	
(v) <i>Trichiurus haumela</i> . .	Abundant on the Madras coasts.	
(vi) <i>Caranx crumenophthalmus</i> .	South-west coast of India.	
(vii) <i>Etroplus suratensis</i> . . . .	Brackish waters . . . .	Can be acclimatised to fresh-water.
<i>IX. Silver bellies group—</i> <i>Equula and Gazza Spp.</i> . .	South-west coast of India . .	12 species of the genus <i>Equula</i> and 3 of <i>Gazza</i> are known (Day).
<i>X. Pomfrets group—</i> <i>Stromateus Spp.</i> . .	Off Sind coast, the gulf of Cambay and in certain areas of the Coromandel coast. Caught in small quantities all along the coast.	
<i>XI. Flat fishes group—</i> <i>Plagusia, etc., Spp.</i> . .	Large specimens off Sind and small ones along the Madras west coast.	Several species of Soles and Tongue fishes are known to exist in Indian seas.
<i>XII. Mullets group—</i> (a) <i>Marine</i> — (i) <i>Mugil speigleri</i> . .	In the larger river estuaries . .	25 species of mullets are known in the Indian seas. Many of these ascend rivers and can be acclimatised to residence in fresh-water.
(ii) <i>Mugil oeur</i> . .		
(b) <i>Freshwater</i> — (i) <i>Mugil corsula</i> . .	In the larger rivers . . . .	4 species of mullets are known to reside in the freshwaters of India.
<i>XIII. " Indian salmon " group—</i> (i) <i>Polynemus tetradactylus</i>	Chiefly near the mouths of rivers.	
(ii) <i>Polynemus paradisicus</i> .	Only in the estuaries of Bengal.	
<i>XIV. Jew fishes group—</i> <i>Sociaena Spp.</i> . .	Bombay, Travancore and northern section of the Madras east coast.	Several species are known some of which come in shoals.
<i>XV. " Live " fishes group—</i> (i) <i>Ophiocephalus Spp.</i> . .	In all tanks, pools, <i>jhils</i> : mostly in stagnant water.	Several species are known which differ only in their colouration.
(ii) <i>Anabas scandens</i> . .	Estuaries and fresh waters of India.	So called because they are able to live out of water due to the presence of accessory breathing organs.
<i>XVI. Carps group—</i> (i) <i>Labeo Spp.</i> . .	In streams, rivers and tanks all over India.	
(ii) <i>Catla buchanani</i> . .		
(iii) <i>Cirrhina mrigala</i> . .	Larger specimens are invariably found only in northern India.	Several species of carps are found in the different parts of India.
(iv) <i>Barbus tor</i> . .		



THE OIL-SARDINE  
Clupea longiceps  
(Length up to 8 inches.)



THE INDIAN MACKEREL.  
Scomber microlepidotus.  
(Length up to 12 inches.)

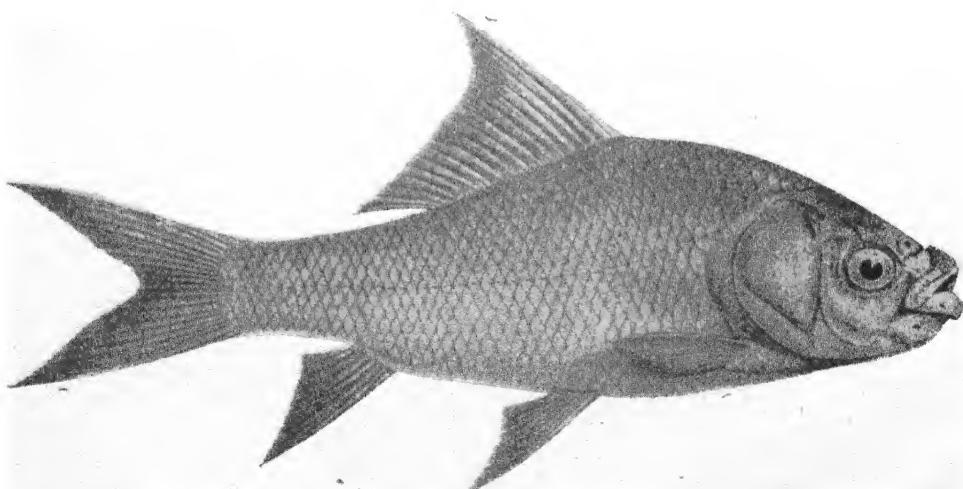


THE SILVER BELLY

Equula splendens

(Length up to 6 inches)

*"Fishes of India"* Day.



THE CATLA

Catla burchanani

(Length up to 4 feet.)

*"Fishes of India"* Day.

Among shell fish, the crustaceans, viz., prawns, crabs and lobsters and certain *Molluscs*, e.g., clams and oysters are edible. The commercially important varieties of shell fish used for food have also been described in the "Preliminary guide" referred to above. The areas where these are chiefly caught may be seen in the following table:—

*The chief commercial shell fish (edible) of India.*

Name of the shell fish.	Localities where chiefly caught.	Remarks.
<i>Crustaceans group.</i>		
1. Prawns—		
(a) Marine—		
(i) <i>Penaeus</i> Spp. . . . .	Off Karachi, West Coast of Madras province in the backwaters of Cochin and Travancore, in the Chilka lake and in the estuarine regions of Bengal.	Several species are known to exist in Indian waters.
(ii) <i>Leucander styliferus</i> . . . . .		
(iii) <i>Metapaneans monoceros</i> . . . . .		
(b) Freshwater—		
<i>Palaemon</i> Spp. . . . .	In the large rivers: Collair Lake in Madras Province.	
2. Lobsters—		
<i>Panulirus</i> Spp. . . . .	Chiefly in Sind and Bengal . . . . .	
3. Crabs—		
(a) Marine—		
(i) <i>Syrella serrata</i> . . . . .	All along the coast in varying quantities.	Several species are known to exist in Indian waters.
(ii) <i>Neptunus pelagicus</i> . . . . .		
(b) Freshwater—		
<i>Paratelphusa spinigera</i> . . . . .	In rivers, lakes and canals.	
4. Clams—		
<i>Tapes</i> . . . . .	In the creeks and estuaries of Sind and Bombay. Small quantities are caught all along the coast.	
<i>Meretrix</i> . . . . .		
5. Oysters—		
<i>Ostrea</i> Spp. . . . .	Karachi harbour, Ennore, Pulicat and Sonapur.	Oyster beds are not properly worked. There is overfishing and the beds are often ruined through industrial and sewage pollution.

In addition to the above-mentioned shell-fishes which are fished and consumed in large quantities, there are several other species occurring along the coasts, which are of local interest and which are fished for local markets. They are Sea-mussels, Cockles, Razor-shell, Whelks, Cuttle-fish and Squids. Sea-mussels are rare, but their flesh is highly esteemed. They are often found in oyster clumps. Whelks are not used as food on a large scale; none of them are eaten on the Sind coast. In the sandy beds of the Bombay coast, whelks are fished along with clams. Squids and cuttle-fish are of some economic importance on the West Coast. Large quantities of these molluscs are sun-dried and there used to be a small export trade in dried squids with China. They are caught along with other edible fish by the fishermen. Cuttle-fish is also valuable for its shell which is used in medicine as well as for polishing wood. Cuttle-fish shells are often found washed ashore. Its flesh is extensively used as a bait by line fishermen.

The pearl oysters and chanks are fished for the commercially valuable pearls and the chank shells respectively. These fisheries are briefly described below.

(a) *Pearl fisheries*.—There are two types of oysters which are sought after: the window-pane oyster (*Placuna placenta*) whose shell is used for decorative purposes and the true pearl oyster (*Pinctada vulgaris*).

Window-pane oysters are found in our creeks and back waters from Sind to the Madras Presidency, but occur also in the open sea off the Coromandel Coast and in the Gulf of Manaar. Fisheries for these shells have existed for many years in the Rann of Cutch and on the Bombay Coast and the object of these fisheries has been to collect the small seed pearls, which, though lacking in lustre and shape, are used widely in indigenous medicine.

The true pearl oysters are found in the Gulfs of Cutch and Manaar but the latter fishery is of greater importance. The Cutch fishery is worked only as a cottage industry. The fisheries in the Gulf of Manaar are erratic in occurrence but have been worked in the past once in fifteen years. Pearl fishing is a crown monopoly and the fishing is conducted under the supervision of the Madras Fisheries Department, with the help of divers who volunteer for the work. Facilities such as towage to and from the fishing grounds, buying of beds, provision of camping quarters, etc., are provided for the divers by the Government free of cost. The oysters are found in about 10-11 fathoms of water and the only diving apparatus used by the Indian and Ceylonese divers is a large stone to help them to descend quickly. They remain submerged for about one minute at a time. The oysters collected are assembled and counted and one-third of the total catch is given to the divers as wages.

Unlike the Japanese oysters which are found in shallow waters in sheltered bays, the Indian variety thrives in the deep sea and has so far failed to acclimatise itself to a shallow water existence. Research is in progress at the Fisheries Biological Station, Krusadai Island, Madras, on the possibilities of rearing pearl oysters in captivity and in making cultured pearls.

(b) *The chank fisheries (Xancus) of Madras* are worked off the six southern maritime districts, viz., Tinnevelly, Ramnad, Tanjore, South Arcot, Chingleput and Nellore, on the East coast. The important ones are those off Tinnevelly and Ramnad which each yield, on an average, 4½ lakhs of shells per year. Excepting the bed off Ramnad district which is owned by the Rajah of Ramnad and for whose monopoly rights he pays a *peshkash*\* to the Government, the other beds are owned by the State as crown monopolies. The fishing which commences by the end of October is conducted in a manner similar to pearl fishing. Wormed shells and shells which are less than 2½" in diameter are excluded while counting. The divers are compensated for by being paid at the rate of one anna† per shell on one-third of the mature shells fished. The shells are sold by auction or by inviting tenders. The price ranges from Rs. 200 to Rs. 240 per 1,000 shells delivered ex-godown.

There are two small beds in Okhamandal and Travancore as well. The Gaekwar of Baroda exercises sovereign rights over the former fishery, while the Travancore Government secures revenue from chanks by imposing an export duty on shells.

Chank shell is put to several uses in India. Small shells are used as feeding cups for infants and for tying round the neck of cattle to ward off "evil eye". Bigger shells are used for blowing and for offering *puja* in temples. The largest number of mature shells are used, however, for making chank bangles, rings, ornaments, buttons, etc. The work is carried on in the Dacca and the Murshidabad districts in the Bengal Province, as a cottage industry. A good quality lime is produced from calcined chank shells which is used for building purposes as also in medicine. The chank meat is edible as a dried product, as a fry and as an ingredient of curry. It is also used in the manufacture of scented sticks to control the burning.

## CHAPTER II.—FISHING GEAR AND METHODS OF FISHING.

### A.—Fishing gear and the fishing industry.

To suit local requirements several distinct types of fishing vessels and implements have been evolved in this country. The factors which have influenced their design are the physical characteristics of the coast-line or the nature of the (inland) water, the types of fish available and the habits of such fish, the proximity of any harbour of refuge to which the fishing boat may run for shelter in a storm and lastly the nature of the demand for fish.

Sea fishing is carried on mainly in small crafts having a displacement of under five tons, in coastal waters from 5 to 7 miles from the shore and within a depth of 10 fathoms. With the exception of a few off-shore fishing boats operating from certain localities, very few fishermen make voyages which would entail staying out in the open sea longer than 12 hours at a time.

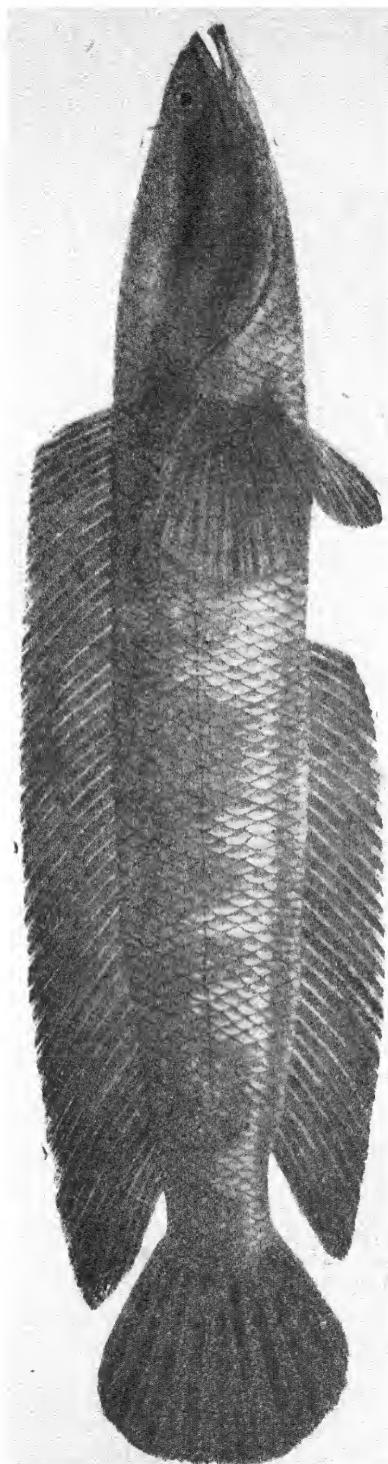
The physical characteristics of the west and east coast of India are very much dissimilar. On the whole of the west coast the typical craft used is the dug-out canoe. In the fine weather which prevails for 8 months from October to May, boats may go out regularly in the sea in the morning with a strong land breeze and return in the afternoon with sea breeze. The coast is not broken by surf and small crafts can be easily launched or beached. The majority of the better fish come near the shore in large shoals, especially in the North and South Canaras and in the Malabar district. That is why the dug-out canoe has been found quite adequate and has not been improved upon. During the south-west monsoon, however, the sea becomes very rough and all maritime activities including fishing have to be suspended.

On the east coast the harbours are chiefly those formed by the estuaries of the larger rivers, a large proportion of which become useless during the fine-weather fishing season (here the south-west monsoon period) owing to the closure of the bars. The surf breaks heavily upon this coast throughout the year. On this coast, the fishing raft known as the *catamaran*‡ is used. In the effective

\*See glossary.

†The amount paid per shell varies from time to time. In 1940 season it was one anna per shell.

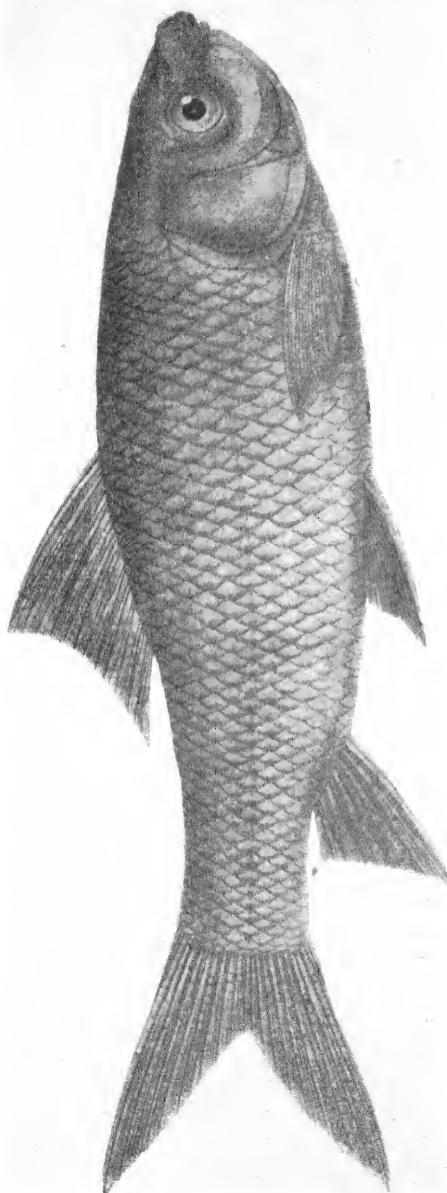
‡Derived from *kattu maram*; in Tamil, *kattu* means lashing and *maram*, timber. This is a keel-less raft see next page).



THE SNAKE-HEADED FISH  
Ophiocephalus striatus

(Length up to 3 feet.)

“*Fishes of India*” Dwy.



THE ROH<sup>U</sup>  
Labeo rohita  
(Length up to 3 feet or more.)

*"Fishes of India" Day.*

7

simplicity of its design, in the safety with which it can be launched and brought ashore through the wildest surf, in the ease with which its parts may be taken apart and carried up the beach and afterwards re-assembled, the catamaran is perhaps the safest craft for use on this surf-beaten coast. A sandy beach is all that is wanted for launching or beaching this craft. To withstand the severe knocking from the surf, the boats used in conjunction with certain types of not near the coast are built of planks which are sewn together with rattan or coir. Ribs and frames are absent and even nails are not used in their construction.

The fishing crafts used in inland waters can be broadly divided into (a) rafts and dug-out canoes, and (b) plank-built boats. Rafts are found in marshy areas where trees are scarce. For fishing in tanks and lakes, coracles are employed. Dug-outs which ply in the rivers are simple and cheap contrivances, but plank-built boats of various types have to be used when, in the larger rivers, strong currents and tides have to be contended with.

As regards nets and other fishing implements, these are such as would help the capture of particular fishes. Large predacious varieties like sharks, perches, etc., are generally caught at a distance of 5 miles from the shore on long lines or with large meshed drift nets. Partially shoaling fishes which do not come near the shore are caught in bag nets or drift nets. When the shoal tends to approach the shore, e.g., Bombay Duck, prawns, etc., stake nets operated by the tides are used. Sardine and mackerel come very close to the sandy shore in the Canara districts of the west coast and highly efficient in-shore drag nets have been designed to capture these. Soles and deep water cat-fishes are caught with trawl-type nets which scour along the bottom.

Stake and dip nets are most widely used in shallow backwaters and tidal estuaries, while cast nets are universally employed along the coasts for the capture of small varieties.

For fishing in rivers, tanks and *jhils*, spears, traps, baited springs, harpoons, nets, etc., are often used. In estuarine fisheries, besides stake nets, seines and dip nets are also common, while drift nets are used in the deep estuarine channels leading direct to the sea. In the lower reaches of the larger rivers where the waters are swift and deep, purse nets, dip nets, drag nets, drift and gilling nets are generally employed. In the upper reaches of the main rivers and in the tributaries which generally go dry during part of the year, fishing is done by traps, weirs and small nets. In *jhils*, *kols* and tanks, fish are caught with drag nets, cast nets, and with traps of many patterns and types.

## B.—Fishing vessels.

### (1). DESCRIPTION OF THE TYPES OF FISHING VESSELS.

(a) *Sea craft*—(i) *West coast—Dug-out canoes*.—The canoe (see upper plate facing page 10) is made by scooping out material from a large trunk of *aini*\* or *cheeni*\* wood. The keel portion is left thicker than the sides. They are of two sizes and are employed for different purposes. The larger ones which run to 32 to 36 feet in length by three feet wide and 2½ feet deep, and of three to five tons burden, are usually used in pairs, chiefly for working bag nets. The smaller ones averaging two tons in burden (24 feet × 3 feet × 1½ feet) are used by drift or cast net fishermen. The larger boats usually carry a crew of seven, the smaller three or four. The bigger canoes have a bamboo mast 15 feet high and a simple sail while the smaller ones generally have two masts and a large canvas sail.

Although shark fishermen proceed farther into the sea than any other coastal fishermen, they prefer the smaller flat-bottomed canoe on account of the ease with which a large shark can be loaded into it. The average life of a dug-out canoe is not less than fifty years.

*Boats*.—The largest of the fishing boats, called *Machwas* (see lower plate facing page 8), are used by Ratnagiri fishermen for deep-sea fishing. They are between five and ten tons displacement, measuring about 30 feet × 9 feet 6 inches × 3 feet 6 inches and are of good sea-going capacity and sailing power. They are generally built of teak frame and planking with subsidiary upper strakes of mango wood. They carry a single mast, and a great press of sail. They are low free-board boats, low in the waist, but without deck or separate accommodation for nets. They are mostly used for deep-sea fishing with big-meshed drift nets. Smaller boats used by drift net fishermen are constructed on the same model.

To shoot the long-haul shores seine—the Rampani net used in the Konkan and Canara districts—a special type of boat is needed. It is called *akada hodi* (see upper plate facing page 9) in the Konkan and *Padaru* in Malabar. In size, these boats range between 18 and 20 feet in length. The basal part of the hull may consist either of a dug-out region with low vertical sides about 3 inches high or of three planks—a bottom plank and two narrow vertical side planks rabbetted† to the sides of basal one.

The boats described above as well as the canoes operating in the southern districts of the Bombay Province have out-rigger equipments. The out-rigger is formed by two curved bamboo poles (*bowkar*) and a float (*uldi*). The poles are laid across the waist of the boat and extend five to six feet on one side of the boat. They are so tied that the distance between the poles decreases towards the distal ends. To these is directly attached the light wooden float, made generally of the timber called *muruka* in Malayalam (*Erythrina indica*).

(ii) *East coast—Catamarans*.—The characteristic sea fishing craft of the east coast is the Catamaran. It is a keel-less raft formed by lashing together three to five pieces, occasionally seven

\*These are Malayalam names.

†See glossary.

pieces, of light rough-hewn wood. The logs (see upper plate facing this page) are from 12 to 15 feet in length, cut square on one edge and carved into a rough cone at the other. The conical end rises slightly above the general level of the raft, and forms the stem of the catamaran. All the logs are not of the same length. The end ones are shorter and when the catamaran is tied up, the conical ends together resemble a horn. These primitive crafts use a bamboo mast and a simple canvas sail.

*Boats.*—The only boats in use are the non-rigid *masula* boats (see lower plate facing page 9) which are constructed with planks without frames or ribs so as to withstand the severe knocking from the surf. Some of them are quite large, ranging from 28 to 35 feet in length, 5 to 8 feet in breadth and 3½ feet in depth, and accommodate a crew of nearly 20. The usual size, however, is 15 feet by 3 feet, intended for crew of about 2. In Baruva in Vizagapatam district, catamarans are provided with a plank on each side to a height of about 9 inches, and serve as boats.

*Boat catamaran.*—The "boat catamaran" is a large catamaran composed of three logs semi-permanently secured together by cross-pieces at either end in such a way that the side logs rise higher than the upper surface of the central one. Thus a longitudinal hollow is formed similar to the cavity in the boats. This craft is seen only between Punnaikayal and the Cape Comorin.

(b) *River craft*—(i) *Rafts and dug-outs.*—There is wide diversity in the materials utilized in the construction of rafts and dug-outs. Inflated skins, plantain stems and bundles of *shola* sticks tied together and forming crazy platforms, and inverted earthenware pots laced together in a bamboo frame-work, are the types commonly met with. Craft of inflated skins are generally found in the upper reaches of the larger rivers. The skins used are generally of buffalo turned inside out. Rafts of plantain stems or *shola* bundles are generally found in the marshy districts of the low lands or for fishing in tanks, *jhils* and other quiet waters, e.g., in Bengal and the Tanjore District in South India. The "chatty" or earthen pot raft is seen in Patna, Gaya, and Hazaribagh. It is constructed usually of 9 earthen pots arranged in rows of three. Connecting bamboos lashed on either side of the mouths of these pots support a light platform of bamboo, the mouth of each pot being closed with a cover of *sal* leaves. An identical *chatty* raft is in use in South India in the districts of Trichinopoly and Tanjore. Single pots are also used, the person sitting astride in the pot. The Sind fisherman uses a narrow mouthed earthen pot more or less as a float in *hilsa* fishing. Here the mouth of the pot is kept tightly closed by the abdomen of the fisherman who leans on it. The circular and bigger coracle is much in use in South India in the Cauvery and the Tungabhadra. The usual type is a shallow cylindrical frame of wicker work about five feet in diameter, over one mouth and the sides of which a cow hide is stretched and firmly tied. Very similar to the coracle is the *tigani* or *gamlu* used in Eastern Bengal. Dug-out canoes called *donga* in Bengal and *ekhta* in Bihar are also very common on the shallow tributaries of the Ganges and other rivers. These are made from the lower ends of the stem of the palmyra palm.

(ii) *Plank-built boats.*—There are various types of these boats. Certain types exclusively used for fishing are described below.

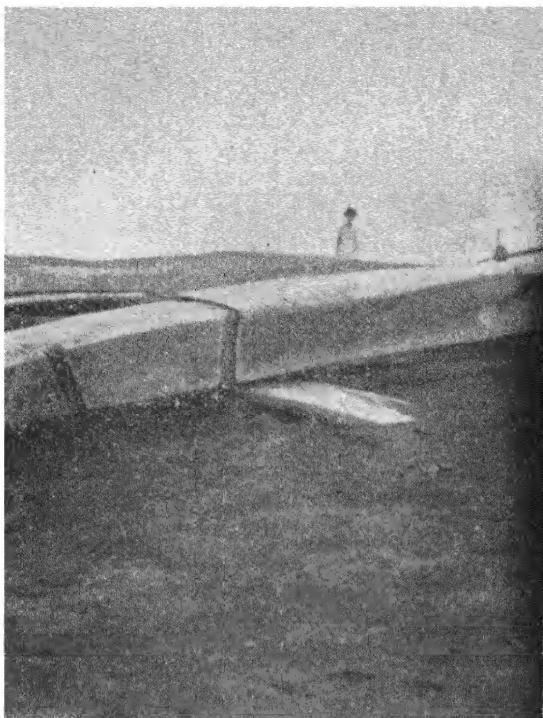
Small riverine crafts are called *dinghis*. Those used for fishing are known widely as *jalia dinghi* to distinguish them from small boats used for transporting goods or passengers. The commonest *jalia dinghi* is the one employed in the *hilsa* fishery in conjunction with the clap net called *sangla*. It is from 15 to 25 feet in length and from 3 to 4 feet in width. The *jalia dinghi* used with the triangular dip net called *bhesal jal* is also very similar.

When rapid transport is needed, e.g., to take the produce of the large fisheries of the Sundarbans to the centres of demand, a narrow boat propelled by numerous rowers is used. The fish carrying *chhip* is a typical example (see upper plate facing page 11).

(iii) *Large fishing boats.*—Of these, the *chhandi* is a good example. It is used in drift-net fishing in the lower and wider reaches of the deltaic rivers. It seldom carries a sail, being propelled by two or more rowers in the bows. The largest size is 60 feet in length and 10 feet in width. Medium sized boats are more common and these have the following dimensions length 34 to 36 feet, beam 5 to 5½ feet and depth about 2 feet. The *chhandi* is partially decked, a few feet at each end being closed in with planking. The rest of the boat is covered with a temporary decking of split bamboos readily removable. Another type of large fishing boat is the *bachari* used for fishing with a big cast net of the same name. It is longer but narrower than the *chhandi* boat. Another interesting boat is the *mechho bichari* used for the transport of "live" fish from the *bil* districts of Eastern Bengal to Calcutta. These boats are from 30 to 50 feet in length and the greater part of the hold is partitioned off to form a live well in which fish are transported in water.

## (2) NUMBER AND DISTRIBUTION OF FISHING VESSELS.

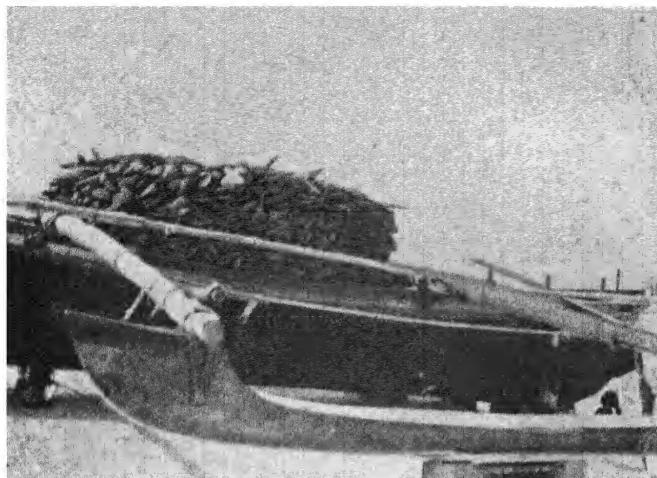
Accurate information regarding the number of fishing vessels or of their distribution in the maritime provinces is not available. In the following table an attempt has been made to approximately estimate the number of various crafts used in sea fishing only. The boats used for marine fishing in Orissa and for estuarine and sea fishing in Bengal, as well as all boats employed for fishing in rivers, tanks and other inland waters have been left out from these estimates.



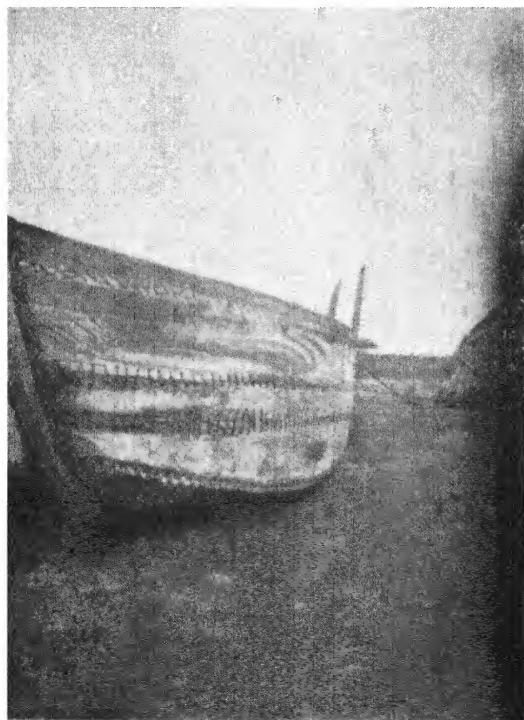
CATAMARAN LOGS.



RATNAGIRI SHARK-DRIFTER.



OUT-RIGGER CANOE USED FOR FISHING WITH THE RAMPANI NET.



MASULA BOAT USED FOR IN-SHORE FISHING ON THE MADRAS EAST COAST.

Table showing the approximate number of vessels used for sea fishing in India.

Section of the coast.	Plank-built boats.	Masula.	Dug-out canoes.		Catamarans.
			Large.	Small.	
<i>West coast.</i>					
Sind	100	..	..	270	..
Gujarat	500	..	..	1,070	..
Bombay city	125	..	..	200	..
Konkan	2,480	..	..	4,930	..
Kanara	400	400*	..	2,620	..
South Kanara	..	225*	1,090	5,250	..
Malabar	..	..	2,700	3,480	..
Cochin	..	..	1,150	1,720	..
Travancore	..	..	3,060	6,040	1,000
<i>East coast.</i>					
Tinnevelly	..	90	..	..	880†
Ramnad	..	180	..	50	120
Tanjore	..	800	..	..	2,582
Chingleput	..	360	..	..	4,360
Nellore	..	300	..	..	1,000
Guntur	..	110	..	8	715
Kistna	..	790	..	485	775
West Godavari	..	760	..	235	115
East Godavari‡	..	140	..	9	1,105
Vizagapatam	..	1,860	..	50	11,200§
Total	3,585	6,135	9,160	27,427	23,859

\* Padavu boats used for operating the Rampani net.

† Boat-catamarans.

‡ Palmyra dug-outs in use.

§ Includes built-up canoes on a catamaran base.

### C.—Fishing implements.

Implements used for catching fish are very numerous, but all of them are variations of a few broad types. The chief fishing implements used can be classified as under :—

- (a) Fixed or stationary nets (see plates facing pages 12 and 13).
- (b) Bag nets and purse nets (see plate facing page 16).
- (c) Seine nets (see plate facing page 14).
- (d) Drift and gilling net (see lower plate facing page 11).
- (e) In-shore drag nets.
- (f) Cast nets (see plate facing page 15).
- (g) Scoop nets.
- (h) "Pouch" traps.
- (i) Trawl-type nets.
- (j) Long lines.
- (k) Miscellaneous appliances, e.g., fish spears, harpoons, fish screens, traps, baited springs, etc.

Large sized fishing implements are employed chiefly in sea fishing. In the back-waters, estuaries and in inland waters, however, traps, tidal operated screen barriers, cast nets and large dip nets are used. Drift nets are used only in the larger back-waters in the vicinity of seaward channels.

The coast of India may be divided into ten natural areas, and the river systems into two from the stand point of fisheries (see frontispiece). These are given below :—

#### Marine fisheries—

- (i) Sind area.—The Cape Monze to the mouth of Sir river.
- (ii) Gujarat area.—The Gulf of Cambay (including the south coast of Kathiawar) and down the coast of Gujarat to the Kolak river.

(iii) *Konkan area*.—From Kalai on the southern frontier of Daman to the mouth of Terekhol creek (i.e., up to the northern boundary of Goa).

(iv) *North-Canara area*.—From Majali on the southern boundary of Goa to Bhatkal near the southernmost coastal limit of the Bombay Province.

(v) *South-Canara area*.—From the southern boundary of the Bombay Province down to the mouth of Balipatnam river, near Cannanore.

(vi) (a) *Malabar Coast area*.—From Cannanore in the north to Cape Comorin, the southernmost point of India.

(b) *Malabar and south Canara areas*.—Back-water fisheries.

(vii) *The Gulf of Mannar area*.—From Cape Comorin to Point Calimere consisting of the Gulf of Mannar and the Palk Strait Bay.

(viii) (a) *The Coromandel Coast area*.—From Point Calimere along the East Madras Coast to the Pulicat Lake (a point about 30 miles to the north of Madras).

(b) *The Coromandel Coast area*.—Back-water fisheries.

(ix) *The Telugu area*.—From Pulicat Lake northwards to Puri in Orissa, including the Chilka Lake.

(x) *The Deltaic area*.—The estuaries of the Mahanadi, the Ganges, and the Brahmaputra stretching from Puri to Cox's Bazar.

#### Riverine fisheries—

(i) The Gangetic system of rivers.

(ii) The Indus system of rivers.

A classified list of the fishing gear used in the areas together with the local names of the nets and other implements, dimensions, brief descriptions of their modes of operation, etc., are given in the "Preliminary Guide to Indian fish, fisheries, methods of fishing and curing" \* on pages 86-153. A summary showing the fishing implements used in the various areas along with their names in the local Indian language will be found in Appendix II.

#### D.—Note on the manufacture of nets and other fishing tackle.

Light nets are made of ordinary cotton thread available in the bazar. These are spun into thicker threads of 3, 4, 5 and 6 strands by means of the *chadu* or *takli*, the common spinning instrument. The stronger but coarser nets are generally prepared with sann hemp fibre (*Crotalaria juncea*). Nets are mostly made in the fishing villages, generally by the fisherwomen.

The nets are frequently "barked". The usual tanning materials employed are *kalisam* or *odyan maram* (*Odina wodier*), *Panachika* (fruit of *Diospyros embryopteris*), or the bark of karel wood which is imported from Zanzibar. The bark (or the dried fruit) is finely ground and the tannin extracted by boiling it with water. When the resultant decoction is cool, the net is soaked in it for some time; after it has been dried on a scaffold, it is run through the decoction a second time. In Bengal coal tar is used for preserving fishing nets. Damaged sections of nets are replaced when necessary by new ones; it often happens that a net "exists for an " indefinite " period, although several of its original sections may have perished and been replaced.

Long lines used in sea fishing are always made of cotton. These are tanned periodically. Indigenous hooks are employed with these lines. The hand-lines used in angling are made of sann hemp, the black fibre from old leaf-stalks of the palmyra and *kitul* palm (*Caryota urens*) trees and the fibres of *calatro phiegiganta*. In Bengal, waste silk is often used. Despite the care taken by fishermen, the average life of a light cotton net is rather limited being only one fishing season of nine months. Nets covered with blood, slime and fish oil, when stored wet, easily lose strength due to bacterial action as well as through heating on account of the oxidation of oils. The life of these nets could be considerably enhanced by sprinkling salt over them before they are piled, as is done in the U.S.A. Blue vitriol (Copper Sulphate) alone or combined with soap and creosote is also largely used in other countries, so that nets might retain their elasticity as well as lightness. Recently Copper Oleate has been recommended by the U.S. Bureau of Fisheries as a highly efficient net preservative.

#### E.—Fishing with power boats.

##### (1) FISHING WITH POWER BOATS IN OTHER COUNTRIES.

The most important development in sea fishing during the last 75 years has been the application of power to the fishing craft. In Great Britain, this has led to the development of the steam trawler and steam drifter. The stimulus towards this development was the increase in the demand for fresh fish due to the advent of the railways, and the inadequate catches made by sailing crafts operating close to the shore. Power boats have not, however, entirely displaced the small sailing craft in Great

\* Marketing Series No. 24, Manager of Publications, Delhi, 1941.

† A trawler operates by dragging a conical bag along the floor of the sea, the mouth of which is kept open either by a beam across the head (the beam trawl) or by pressure of water upon wooden "kites" known as trawler boards (the otter trawl). The fish are driven into the narrow end. The steam drifter uses very large drift nets.



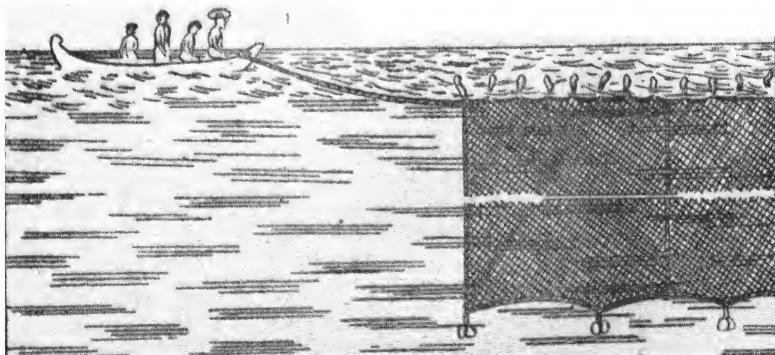
DUG-OUT CANOE.



BOATS USED FOR THE TRANSPORT OF DRIED FISH IN ASSAM.



FISH CARRIER, *Chhip* FOR TRANSPORT OF FISH IN BENGAL.



THE MODE OF OPERATION OF A DRIFT OR GILLING NET.

Britain even today. Wherever coal is expensive, or the fishing grounds are close by, small sailing crafts still hold the field.

Power may be used for other purposes besides propulsion. In otter trawls, for example, power is needed for dragging the heavy net along the bottom of the sea and for hauling the net. In drifting or in seine-net\* fishing, power is required mainly for propulsion.

The type of fishing gear employed depends upon the kind of fish sought. Trawling is the chief method employed for bottom feeding "white fish" like cod, haddock, plaice, dab, etc. These constitute nearly 3/5 of the fish landed in Great Britain and hence the large number of trawlers in use in the British waters. The Danes who fish not far from their coast prefer small crafts fitted with motors for their seine-net fishing. In the inshore fisheries of Canada, motor boats using nets and lines are employed. In Japan the fishing industry has made rapid progress as a result of employing larger fishing boats and fitting them with auxiliary motor engines. The number of motor driven boats in that country increased from 5,000 in 1920 to 31,000 in 1931. In other countries also, progress has been achieved by constructing larger boats, fitting them with motor engines, and by using bigger and more efficient fishing implements. Side by side, methods of preserving fish have also been improved upon and perfected.

With the introduction of power, there has also been a growing tendency towards concentration of the industry in a few hands and at a few places. While this has certain advantages, it results in the dwindling in importance of the smaller fishing centres and also in a fall in the number of fishermen regularly employed.

#### (2) USE OF TRAWLERS IN INDIA.

Before introducing costly deep-sea fishing methods with improved types of gear, accurate data regarding the nature of the fishing grounds, their potentialities and the suitability of the gear contemplated for general adoption, should first be collected. Where fishing is seasonal, the applicability of the gear in the different fishing grounds in the different seasons has also to be tested. Investigations of this nature involve a considerable expenditure of money and the few experiments in deep-sea fishing that have been made during the last thirty years have not led to any conclusive results.

The table below shows the experiments so far made in Indian and adjacent waters with steam vessels :

*Experiments for catching fish in Indian waters with steam vessels.*

Year.	Vessels.	Area surveyed.	Method of fishing employed.	Privately or officially owned.	Results and Remarks.
1902 .	Steam Trawler "Violet".	Ceylon and adjacent South Indian waters.	Otter trawl .	Private official and	Results not made available to the public. A private trawling company was formed, but this had soon to be wound up owing to the hostility of the fisher-folk.
1906-07 .	do. .	do. .	do. .	do. .	Some good trawling grounds in depth from 15-40 fathoms were discovered; the grounds, however, were not extensive.
1913-14 .	do. .	do. .	do. .	Official .	Trawling was recommended officially and a private company was formed.
1920-23 .	Steam Trawler "Lilla".	do. .	do. .	do. .	Results not made available to the public. This was a research ship as well.
1924 onwards.	Steam Trawler "Nautilus".	do. .	do. .	do. .	The marine survey has shown that the Bay will yield an ample supply of fish and that the catches can be profitably put on the Calcutta markets. Trawling is possible in the Bay even during the monsoon months.
1908-11 .	Steam Trawler "Golden Crown".	Northern portion of the Bay of Bengal and down to Rangoon.	Otter trawl .	Private official and	

\* The shoal of fish is gradually encircled with the net in the centre of which there is a bag like that of the trawl.

Year.	Vessels.	Area surveyed.	Method of fishing employed.	Privately or officially owned.	Results and Remarks.
1900	Steam Trawler "Premier".	Bombay. Coastal waters off Bombay.	Beam trawl	Private	Was a small boat.
1921-22	Steam Trawler "William Carrick".	Bombay and Sind waters.	Otter trawl	Official	Fairly good catches. The experiment was done on commercial basis and caused a net loss of Rs. 3-18 lakhs. Proved financially unsuccessful.
1923	Steam Trawler "Madras".	do.	do.	Private	Results not known.
1907-08	Steam Boat "Margarita".	Madras. Coastal waters off Mysore.	Beam trawl and an otter trawl during the last stages.	Official	The boat was small and the gear of not sufficient power. No conclusive results.
1927-31	Steam Trawler "Lady Goshen".	Off the western, southern and eastern aspects of the Cape Comorin. Selected sections of the east and west coasts of the Madras Province.	Otter trawl	do.	Cost of operations Rs. 5-63 lakhs. Mainly explorative surveys were made. The trawler had to remain idle for most of the time due either to trouble in the engine or difficulties of getting a crew. It is reported that some remarkable fishery grounds such as Wedge Bank, San Pedro Bank, the grounds off Point Calimero etc. had been discovered.

It will be observed that all these experiments were attempts to introduce the British trawling methods into the Indian seas. Of the above, only those with the "Golden Crown" and the "William Carrick" were started on commercial lines, but for various reasons the ventures were given up after a few preliminary trials. The other experiments were mostly by way of preliminary survey or research. A number of committees have reported on these experiments and one of the most important conclusion of the Madras committee which reported in 1919 was that till harbours and cold stores were available, trawling on a commercial basis would not be feasible.

*Kinds of fish caught in the above experiments—Bay of Bengal (Golden Crown).*—Skates and rays 81, per cent. Jew fish 21.3 per cent. Cat fishes 20.1 per cent., perches 10.4 per cent., eels 9.6 per cent., pomfrets 3.5 per cent. and other species, chiefly horse mackerels, soles and prawns 27 per cent. The average rate of catching was 26.6 omts. per day's trawling.

*Kinds of fish caught in the above experiments—Bombay waters.*—Rays 24 per cent., perches 15.5 per cent., Jew fish 14 per cent., Cat fishes 8 per cent., eels 8 per cent., white pomfrets 4 per cent., Indian salmon 1.5 per cent., all others 25 per cent. The average rate of catching per day was 12.5 omts.

*Madras waters.*—Over 20 species were caught all of which were bottom feeders: sharks and rays contributed 19 per cent., perches 8 per cent., Jew fish 1.8 per cent.; cat fishes 2.7 per cent.; other kinds comprising "velameenu" (*Lethrinus nebulosus*), "kalawa" (*Epinephelus Sp.*), "cheppili" (*Lutjanus sp.*) and "tholen" (*Diagramma punctatum*) 58 per cent. The average rate of catching per day of 21½ trawling hours was 27 omts. in the Wedge Bank.

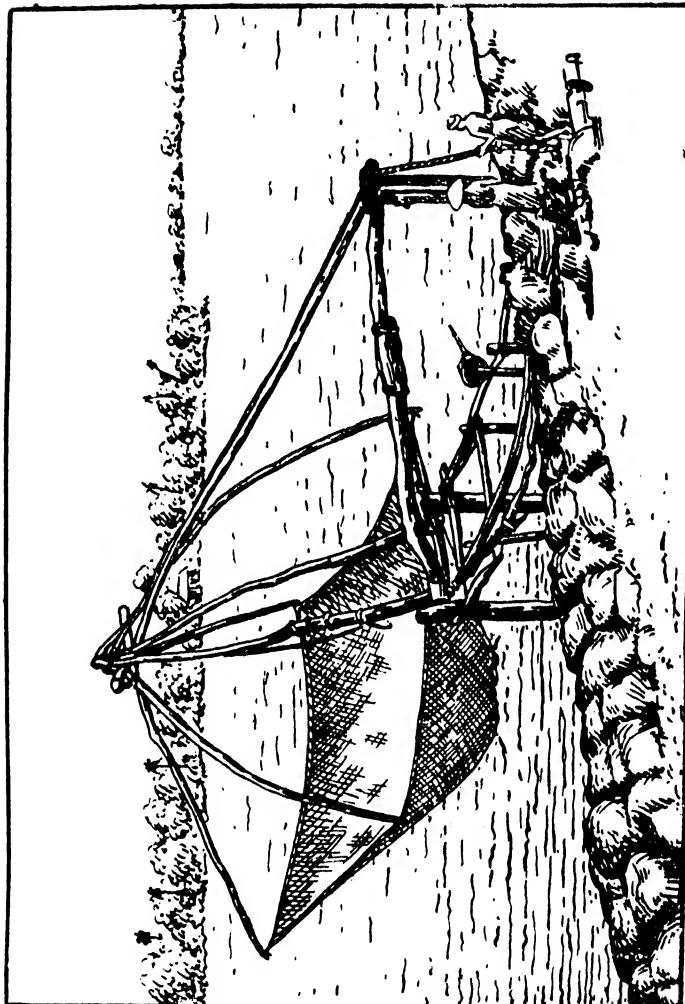
The lessons to be learnt from these experiments, brief as they were, may be summarized as follows:—

1. Steam trawling, the most powerful and expensive western method of deep-sea fishing, is not very suitable for India, as trawl grounds are limited. The heavy mud and coral bottoms handicap the otter trawl.

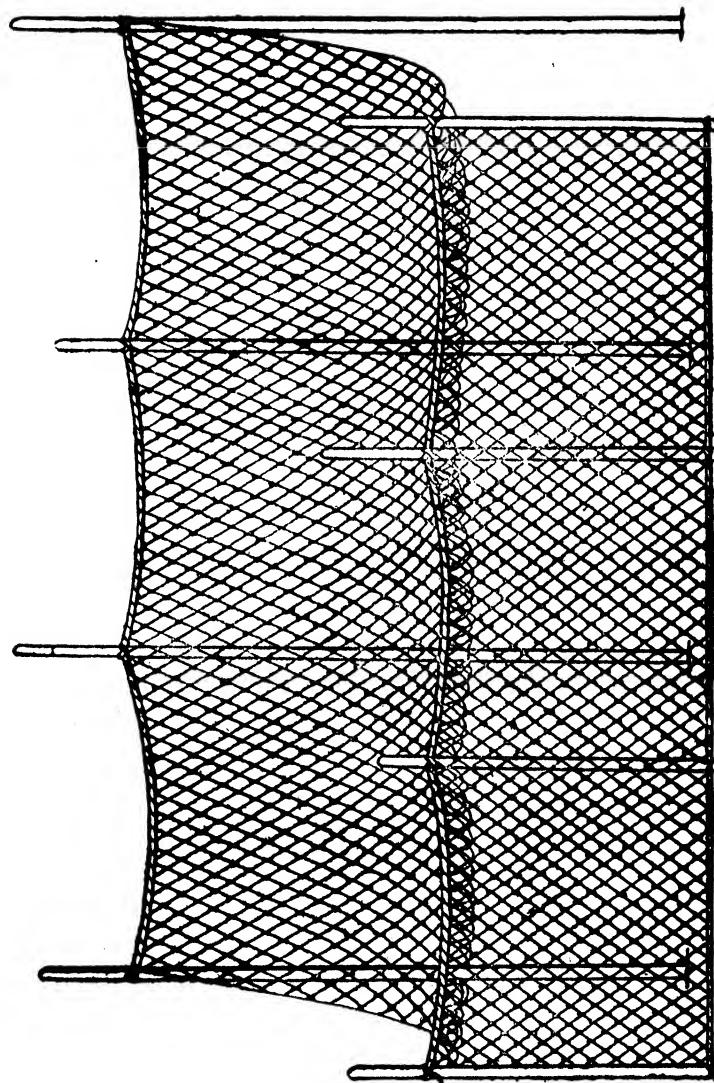
2. The bulk of the fish caught are not prime food fish, the better class fish of India being surface and mid-water species.

3. The trade and the consuming public in India cannot afford to pay remunerative prices for fish so as to make steam trawling a paying proposition. (The average wholesale price of trawled fish is not more than two annas per pound, while in the experiments conducted, the cost, itself worked out at four to five annas per pound.)

4. Other available modern methods of deep-sea fishing will have to be tried out. In view of the swimming habits of the food fishes, seining, drift-ing and long-lining promise to yield better results.



CHINESE BALANCED DIP NET USED IN THE COCHIN BACK WATERS.



KATTU VALAI, A HIGHLY SPECIALISED FORM OF STATIONARY NET, USED IN THE COROMANDEL BACKWATERS.

**(3) POSSIBILITIES OF BETTER OFF-SHORE FISHING USING POWER.**

(a) *Drifter trawling and seine nets.*—\*Mr. Hefford has suggested that a more suitable vessel for fishing in Bombay waters is the smaller drifter trawler, equipped with a trawl, Danish seine† and large indigenous drift nets. The Danish seine is an improved type of gear which, under certain conditions, is capable of catching as much fish as the otter trawler, but with much less expenditure of power, since fuel is required only for steaming to and from the grounds. The gear is light, does not injure the fish as it is hauled in slowly, and is adaptable for fish which lie near the bottom as well as for those that swim in the higher levels of water. The initial cost of equipping a vessel with the Danish seine is only one-fourth of the cost of a trawl while a new vessel can be built and completely equipped at about one-tenth of the cost of steam trawler.‡ Only about half the crew of a steam trawler is needed for operating this gear. Being of light twine, large sharks and dog fishes might, however, go through it.

(b) *Development of motor boat fishing.*—Another possible line of development would be the introduction of motor boats fitted with large seine and drift nets. Such a boat would take the crews safely and comfortably into the further waters of the fishing grounds, and allow of the use of better and more powerful nets and lines. The cost of these boats with the full complement of nets, etc., would not also be high. Also, in view of the meagre harbour facilities, while being more roomy and better constructed than the catamaran or the canoe, it should be equally capable of being beached securely and launched against a heavy surf. After a study of the sea-going crafts in other countries, the introduction of the Yorkshire coble has been recommended by the Madras Fisheries Department as the most likely immediate improvement possible in Indian sea-going fishing craft. The coble is a distinctive type of craft. With a high shouldered bow and a deep grip, she carries a flat floor aft to her low stern, beneath which two "skorvels" or shallow bilge keels, help to keep her upright and to launch her down the beach. The twin keels shield the propeller from coming into contact with the ground when the boat is beached or launched. It has a deep fore-part which is useful in coming head first off the shore into a breaking sea. It gives her a powerful grip which, added to the hold given by the deep rudder, enables the coble to be a very fine performer on a wind, especially in a sea-way.

A coble was purchased by the Madras Government in 1930 for Rs. 2,920 and a Scottish master fisherman was appointed to try the large seine and drift nets with the coble. Due to reasons of health he had to return before the experiments even commenced.

In the Bombay Province Dr. H. T. Sorley, after his survey of marine fisheries of the Province, recommended in 1931 that for augmenting the fish supply in Bombay (1) the existing types of a small fishing boat of about 4 or 5 tons be decked and fitted with an auxiliary engine and (2) that the average fishermen of the *Koli* caste be educated to work power-propelled vessels of this kind. This recommendation has been partially implemented by the Bombay Government.

The conclusion, therefore, is that a suitable manner of using power and suitable gear for fishing in Indian waters has yet to be tried out and evolved. The earlier experiments were wholesale adoption of British trawling methods, and have not proved successful in India. Later, the use of motor boats, drifter trawlers, and Danish seine nets were suggested, but their performance has not been tested yet. It is recommended that at the end of the present War these should be tried out in a series of carefully planned experiments and, as far as possible, on commercial lines.

**CHAPTER III.—SUPPLY.**

Fisheries constitute the third most important industry in India, the other two being agriculture and livestock. There is a considerable extent of localization in the supply of fish. This is caused by lack of speedy transport and the peculiar habits of the people who would consume only those varieties that are caught nearby.

**A.—Total supplies—Annual landings of fish.**

**(1) METHOD OF SURVEY.**

Fish statistics for the whole of India are not available. "Fisheries" is a provincial subject and only in certain provinces is adequate attention paid to it. Collection of statistics is rendered difficult by the fact that the industry is scattered and is run on primitive lines. Along every mile of the vast coastline of India and in every river, tank, pond, etc., fishing goes on. The boats go out by night or day and the catches are often sold off to local purchasers immediately they are landed. Moreover, the fishermen have no idea of weights: they speak either in terms of baskets (of varying sizes), or of divisions of boats (in Madras west coast) or of number. The multitude of vernacular names current in the different parts of the country and applied to the same fish is another stumbling block.

Some maritime provinces, notably Madras, have started compiling fish statistics with the help of the subordinate fish curing yard staff of the Fisheries Departments. The figures can be taken to be representative only when the fish curing yards are numerous and cover the whole coastline without a break, as in the West Coast of the Madras Province.

\* Hefford: Report on the work of the trawler "William Carrick" Bombay (1923).

† The use of Danish seine nets from motor cutters was suggested by Mr. Hornell in 1908. The Fishery Expert to the Government of Bengal has also commended its use (1939).

‡ These are pre-war estimates.

In this report, figures of the quantities of different kinds of fish caught in the various areas are only estimates. In the case of sea fish, these estimates have been made after taking into account (i) fish curing yard figures, (ii) number of fishing boats in use, (iii) the number of adult fishermen engaged in fishing, (iv) published and unpublished fish statistics of the Madras Province, (v) import and export figures of preserved fish and fish products in the publications issued by the Director, Commercial Intelligence (vi) figures of movement of fish by rail and (vii) figures of arrivals of fish in municipal markets, *bunders* (ports), etc., in the principal cities. As regards freshwater fish, the estimates are based mainly on information supplied by local officers, the trade and municipalities, as no exact data of any kind are available.

(2) PRODUCTION OF FISH IN INDIA.

The total annual production of fish in India is estimated as follows :—

*Estimated production of fish in India.*

	Quantity in lakhs of maunds.	Value in lakhs of rupees.
Sea-fish (including fish caught in estuaries and back-waters) . . . . .	116.7	302.7
Freshwater fish (excluding fish caught by non-professional fishermen) . . . . .	62.6	742.3
Total . . . . .	179.3	1,045.0

It will be observed that while the sea yields almost double the harvest, from the point of value freshwater fisheries are more important. Sea-fish does not fetch as much price as freshwater fish because most of the fishing centres on the sea coast are not easily accessible from the consuming markets and also because more sea-fish are generally caught than can be consumed fresh. Freshwater fish, on the other hand, are caught in limited quantities in thousands of small centres in India. The quantities landed in any particular centre are easily absorbed in the fresh condition by the local markets.

(a) *Sea-fish*.—The total annual production of sea-fish is given separately for the various areas in the following table :—

*Estimated production of sea-fish in India.*

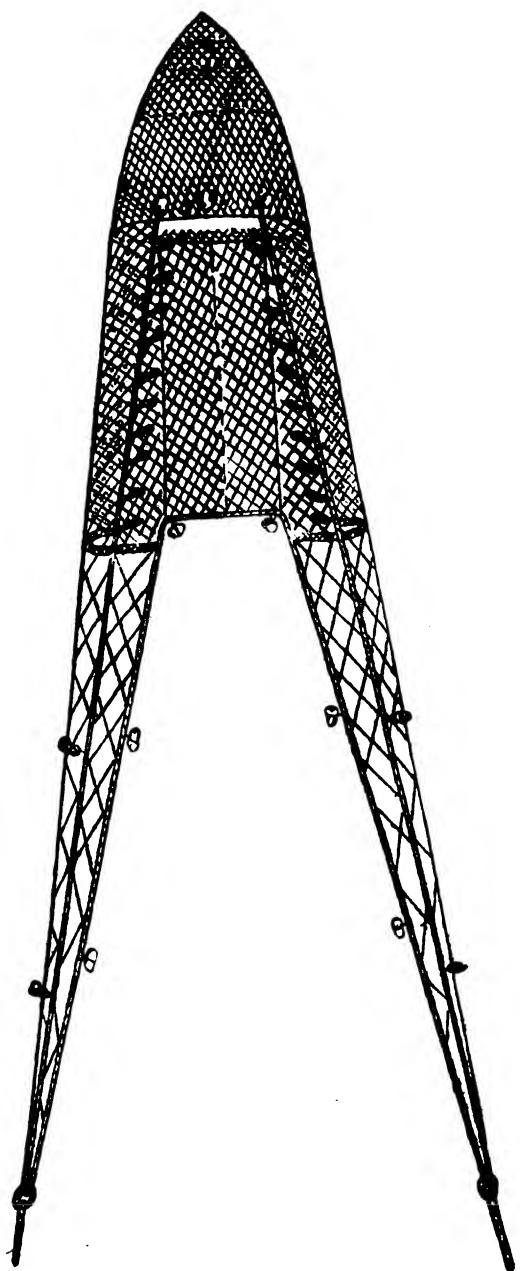
Areas.	Total catch (in thousands of maunds).	Percentage to Indian total.	Value (in lakhs of rupees).	Percentage to Indian total.	Number of adult fisher- men engaged in sea-fishing.	Catch per fisherman.
1. Baluchistan States	92.6	0.70	5.0	1.65	2,224*	41.6
2. Sind coast . . .	197.8	1.70	10.6	3.50	2,00†	76.1
3. Kathiawar . . .	99.8	0.83	5.4	1.78	2,306†	43.3
4. Bombay—						
(a) Gujarat . . .	107.7	0.92			8,212†	33.5
(b) North Thana zone.	163.9	1.40			8,437†	47.7
(c) South Thana zone.	380.6	3.30	73.0	24.12	9,505†	40.0
(d) Ratnagiri coast	497.3	4.23			11,289†	44.1
(e) North Canara coast.	211.6	1.80			5,548†	38.2
5. Madras—						
(i) West coast—						
(a) South Canara coast.	1,019.9	8.74			15,352†	66.4
(b) Malabar coast	1,877.5	16.08	50.7	16.75	27,010†	69.5
(ii) East coast—						
(a) Southern sec- tion.	182.4	1.56			9,572†	19.1
(b) Central section	270.4	2.32	31.3	10.34	13,287†	20.4
(c) Northern sec- tion.	1,316.7	11.29			68,671†	19.2
6. Cochin State . . .	620.8	5.37	16.3	5.39	8,155*	76.9
7. Travancore State . .	2,588.9	22.19	64.7	21.37	30,093§	86.0
8. Orissa coast . . .	303.3	2.30	11.1	3.67	..	..
9. Bengal coast . . .	1,729.0	14.82	34.6	11.43	..	..
Total . . . . .	11,665.2	(100)	302.7	(100)	..	..

\* 1931 Census.

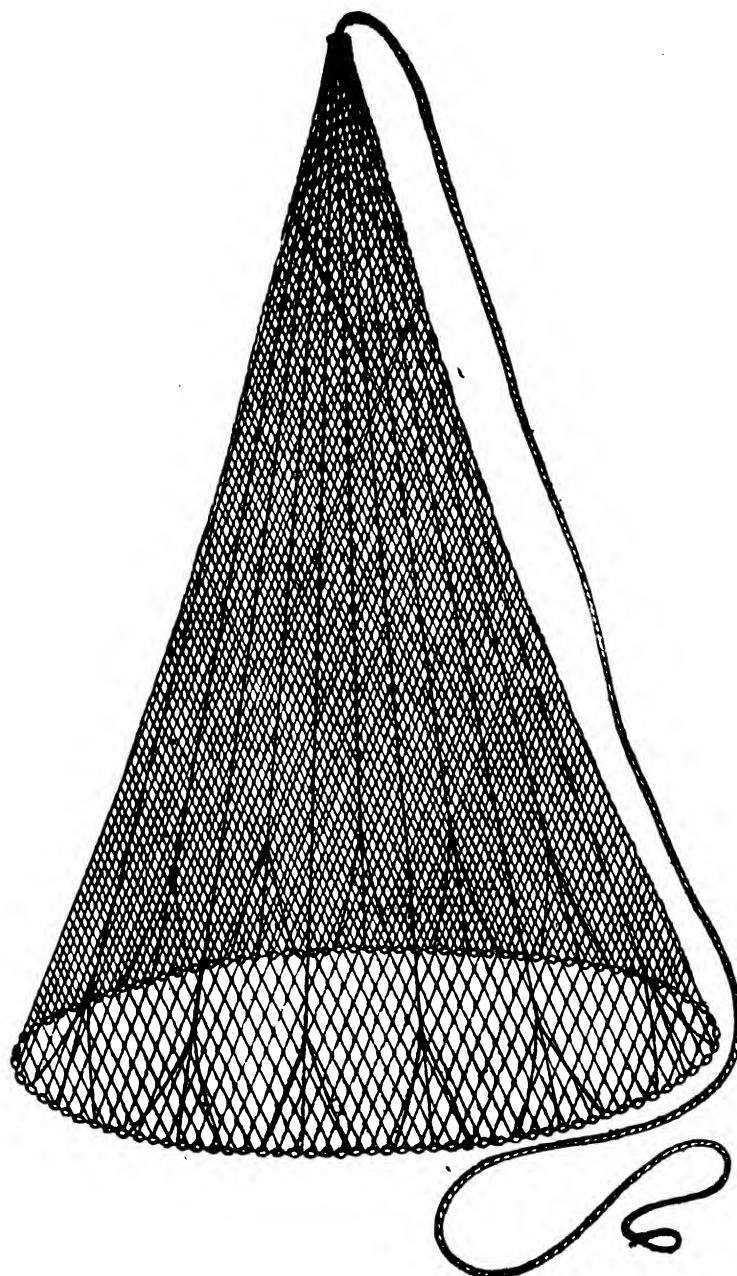
† From "Marine Fisheries of the Bombay Province" by H. T. Sorley.

‡ Special census of the number of fishermen conducted by the Madras Fisheries Department in 1940-41.

§ 1941 Census (unpublished data).



A BOAT-SEINE VAKKU VALA, USED IN THE MALABAR COAST.



A "STRINGED" CAST NET.

It will be seen that the estimated total production of sea-fish in India is over 11·6 million maunds annually, of which about 71 per cent. is produced in British India and 29 per cent. in the Indian States.

It will be noted that all the fishing grounds are not equally productive. Excluding Baluchistan, the littoral area of India along the west coast is about 1,150 miles, but 66 per cent. of the total catch is landed here, while the Bay of Bengal coast, although it stretches over 1,770 miles, produces only the remaining one-third. Along the west coast again, the South Canara and Malabar districts of the Madras Province with a coastline of 215 miles account for 24·8 per cent. of the Indian total, which is more than double that caught along 550 miles of Bombay littoral. From the point of view of value, however, 13·61 lakh maunds caught in Bombay fetch Rs. 73·0 lakhs against Rs. 50·7 lakhs for 28·97 lakh maunds landed on the Madras west coast. On the Bay of Bengal coast, the fore-shore of Bengal is the most productive. Owing to the peculiar physical features of the coast line of this province—the area is a tangled region of estuaries, rivers and watercourses and is uninhabited except during calm weather—the marine fishery resources of Bengal have been but slightly tapped; but even then the quantity of fish caught is considerable and fair prices are also obtained.

(b) *Freshwater fish.*—The actual harvest of the freshwater fisheries cannot be estimated. The table given below shows the estimated marketable surplus in the various provinces and States:—

*Estimated marketable surplus of freshwater fish.*

Province/State.	Production (in thousands of maunds).	Percentage to total catch.	Estimated value (in lakhs of rupees).	Percentage to total.
(British India)				
Assam . . . . .	721·6	11·6	46·22	6·23
Bengal . . . . .	3,133·2	50·1	432·92	58·32
Bihar . . . . .	959·5	15·3	95·90	12·93
Bombay . . . . .	81·0	1·3	9·82	1·82
Central Provinces and Berar . . . . .	156·0	2·5	16·28	2·19
Coorg . . . . .	0·1	Neg.	0·02	Neg.
Delhi . . . . .	5·6	0·1	0·80	0·11
Madras . . . . .	187·0	3·0	13·96	1·88
North-West Frontier Province . . . . .	1·5	Neg.	0·24	0·03
Orissa . . . . .	326·0	5·2	34·92	4·70
Punjab . . . . .	25·0	0·4	3·99	0·55
Sind . . . . .	266·3	4·3	38·53	5·19
United Provinces . . . . .	147·0	2·3	22·77	3·07
Total Provinces . . .	6,010·0	96·0	716·49	96·52
(Indian States)				
Baroda . . . . .	9·8	0·2	1·99	0·27
Cochin . . . . .	15·5	0·3	0·83	0·11
Gwalior . . . . .	8·1	0·1	1·25	0·17
Hyderabad . . . . .	20·0	0·3	2·17	0·29
Jammu and Kashmir . . . . .	17·8	0·3	2·88	0·39
Mysore . . . . .	10·3	0·2	1·55	0·21
Travancore . . . . .	74·8	1·2	4·01	0·54
Other States . . . . .	92·6	1·4	11·16	1·50
Total States . . . .	248·0	4·0	25·84	3·48
Total India . . . .	6,258·0	(100)	742·33	(100)

It will be observed that 96 per cent. of the available freshwater fish is marketed in the British Indian provinces and only 4 per cent. in the Indian States. Among the provinces Bengal leads both in production as well as value, with 50·1 per cent. and 58·32 per cent. respectively. Bihar ranks second and Assam is a close third in regard to the available surplus and the three provinces of Bengal, Bihar and Assam together account for 76·0 per cent. of the total freshwater fish marketed in India. Madras, the leading province in the production of sea-fish, catches only 3 per cent. of the Indian total as far as freshwater fish are concerned. The Indus in Sind, the Mahanadi in Orissa and the Ganges and its tributaries in the United Provinces yield 4·3, 5·2 and 2·3 per cent. of the Indian total.

The share of the Indian States is quite small, no State accounting for more than 1·2 per cent. of the total Indian market supplies.

## (3) CLASSIFICATION OF INDIAN FISH.

Although more than 1,500 distinct species of fish are known to exist in Indian waters the varieties that are caught in appreciable quantities are limited in number. As explained in the chapter on "Types of fish", these commercially important varieties can be classified further into fifteen groups in the case of sea-fish and eight in the case of freshwater fish.

(a) *Sea-fish*.—The following abstract of Appendix No. III based on the classification referred to shows the positions regarding the main groups. This is further illustrated in the diagram facing page 17 :—

*Estimated total catch of fresh sea-fish classified according to groups.*

Name of the group.	Estimated annual catch (in thousands of maunds).	Percentage to total.
1. Elasmobranchs . . . . .	500	4.3
2. Eels . . . . .	30	0.3
3. Cat-fishes . . . . .	343	2.9
4. Dorab or silver-bar fish . . . . .	81	4.7
5. Herring and Anchovies* . . . . .	3,970	31.0
6. Bombay Duck . . . . .	398	1.8
7. Mackerels and perchies . . . . .	2,535	21.7
8. Silver-bellies . . . . .	313	2.6
9. Pomfrets . . . . .	182	1.6
10. Flat fishes . . . . .	236	2.3
11. Mullets . . . . .	186	1.4
12. Indian salmon . . . . .	187	1.6
13. Jew fishes . . . . .	438	3.8
14. Crustaceans . . . . .	1,160	10.0
15. Minor shell-fishes . . . . .	63	0.5
16. Miscellaneous . . . . .	1,224	10.5
Total . . . . .	11,666	100.0

\* Hilsa being a marine and estuarine fish is included in the table for Sea-fish although its fishery is mainly in freshwater during the flood season.

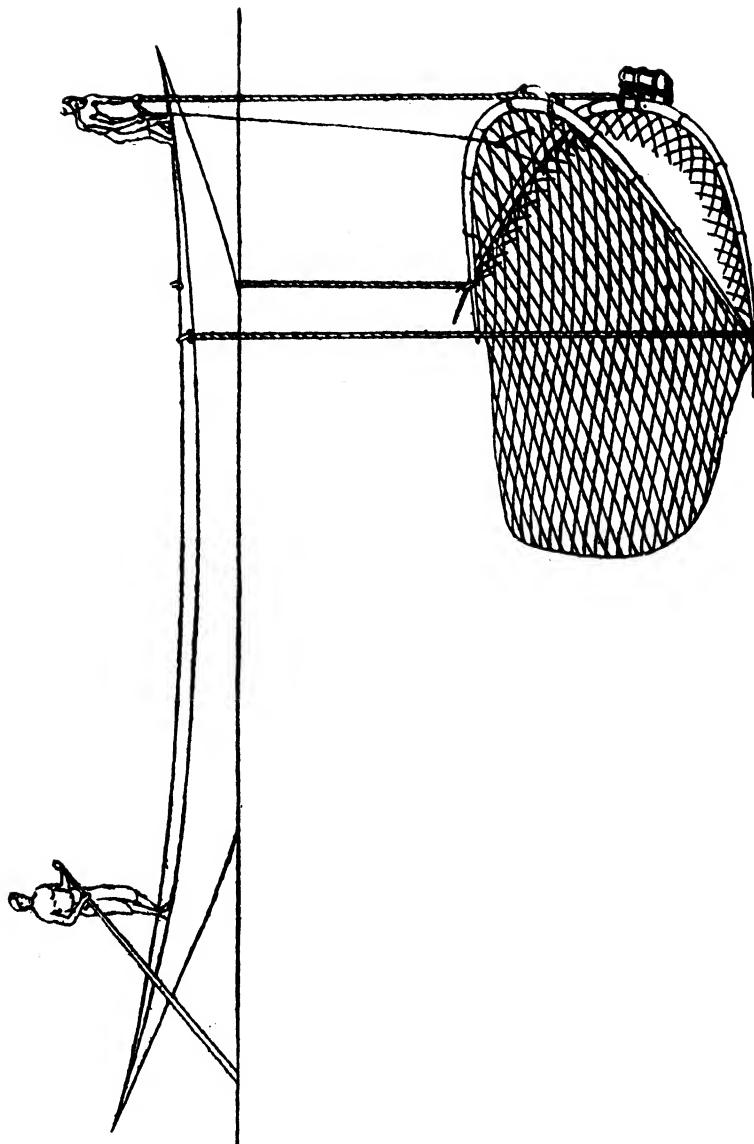
It will be observed that the group "Herrings and Anchovies" accounts for over a third of the total catch. "Mackerels and perchies", in which group are included the diminutive but numerically abundant Indian mackerel, the coarse horse-mackerel and the large and toothsome beekti, comes next accounting for 21.7 per cent. of the Indian total. Prawns constitute the chief item in the group "Crustaceans" and this group occupies the third rank with 10 per cent. Pomfrets, mullets and the Indian salmon, although very popular, are caught only in comparatively small quantities, the respective percentages being 1.6, 1.4 and 1.6.

(b) *Freshwater fish*.—The position regarding freshwater fish placed on the market is shown in Appendix IV of which the table given below is an abstract. The diagram facing page 17 shows at a glance the quantitative distribution according to the eight main groups:—

*Classification of the marketable surplus of freshwater fish according to groups.*

Name of the group.	Estimated quantity available (in thousands of maunds).	Percentage to total.
(1) Cat-fishes . . . . .	2,044	32.7
(2) Mullets . . . . .	380	6.1
(3) Carps . . . . .	2,146	34.3
(4) Prawns . . . . .	471	7.5
(5) "Live" fishes . . . . .	616	9.8
(6) Feather-backs . . . . .	294	4.7
(7) Eels . . . . .	53	0.8
(8) Herrings and the anchovies . . . . .	24	0.4
(9) Miscellaneous . . . . .	231	3.7
Total . . . . .	6,259	100.0

Carps constitute over a third of the total freshwater fish marketed in India, closely followed by cat fishes with 32.7 per cent. These two groups together account for 67 per cent. of the available total, while "live" fishes and crustaceans constitute 9.8 and 7.5 per cent. respectively to this total.



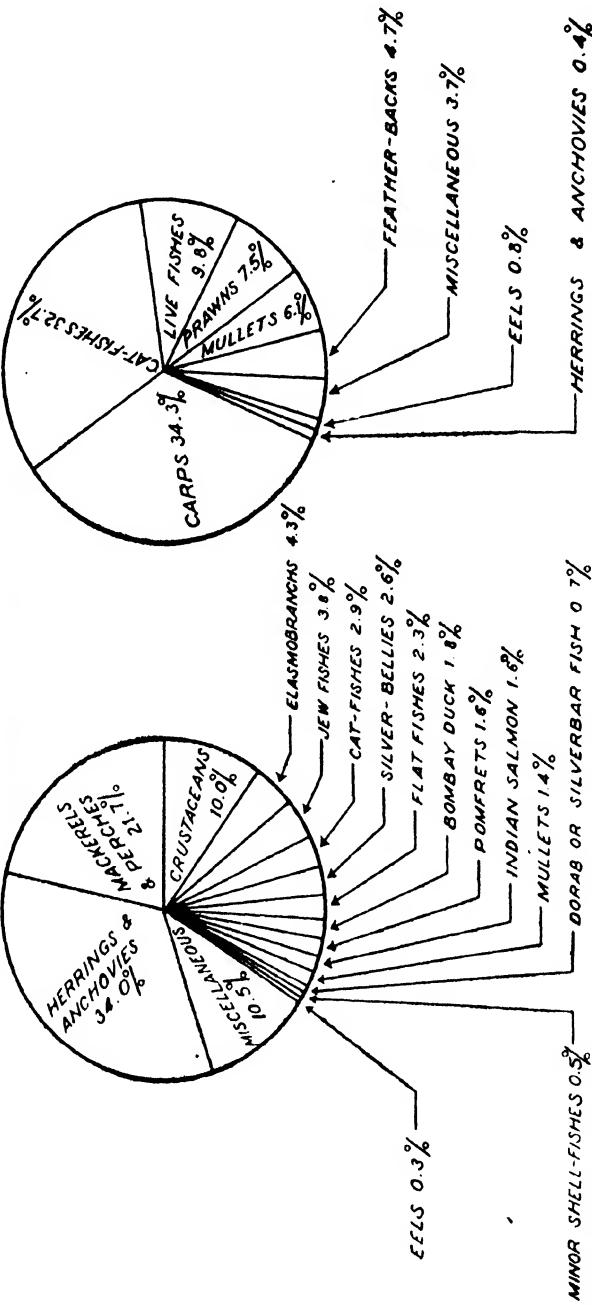
FISHING WITH THE PURSE SHAPED *Shangla-jai* (AFTER HORNELL).

**INDIAN FISH PRODUCTION CLASSIFIED ACCORDING TO COMMERCIALLY**

**IMPORTANT GROUPS**

**SEA FISH**

**FRESH WATER FISH**



## (4) CLASSIFICATION ACCORDING TO FISHING AREAS.

The distribution of the edible varieties of fish in the different areas does not conform to any definite rule, and in most cases, the reasons for such seemingly haphazard distribution are not known.

(a) *Sea-fish*.—Appendix VII shows in detail the quantities and varieties of sea-fish landed in the different coastal areas of India. The diagram facing page 18 indicates the position at a glance.

(b) *Freshwater fish*.—The distribution of the various types of freshwater fish in the provinces and major States can be seen in Appendix IV. The diagram facing page 19 indicates the distribution at a glance.

## (5) SEASONAL VARIATIONS IN PRODUCTION.

Fishing is a seasonal industry in India, in the sea as well as in freshwater. During the monsoon months fishing is generally poor, squally weather conditions in the sea and increase in the flow and volume of water in rivers and tanks respectively being responsible for this. The only exception is the Hilsa fishing which is prosecuted when rivers become swollen with flood water.

(a) *Sea-fish*.—As already described in the chapter on "Fishing gear and methods of fishing" sea-fishing in India is confined to the coastal waters and the fishing boats ply only when calm weather prevails.

The fishing season starts more or less simultaneously at all fishing centres of the west coast immediately after the conclusion of the south-west monsoon. The season reaches its height in some years in October, in others, in November. It is at its ebb in February from when onwards there is a progressive decline in the quantities landed.

On the Madras east coast the conditions are slightly different because this portion of the coast-line is not within the belt of the south-west monsoon. The catch is more or less uniformly spread throughout the year, and during May and June when fishing is very poor on the west coast, appreciable quantities are caught here. In Orissa-Bengal coast the month of peak production is July owing to the riverward migration of Hilsa. In other respects the season resembles that of the west coast although production is more uniformly distributed over the months than on the latter coast. The diagram facing page 20 and adjoining table show the estimated total catch of fish in five sectors three of the west and two of the Bay of Bengal coasts during the different months.

*Proportion of the total catch of sea-fish landed every month along 5 different strips of Indian coast line.*

	Sind-Kathiawar coast.	Bombay coast.	South-West coast.	South-East coast.	Orissa-Bengal coast.
Total catch (thousands of mounds) .	298	1,362	6,112	1,769	2,038
	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
January . . . . .	13.7	10.2	7.4	11.6	10.6
February . . . . .	12.4	7.8	4.8	11.4	9.7
March . . . . .	9.0	6.7	3.9	8.6	8.1
April . . . . .	4.3	4.8	4.0	10.0	7.1
May . . . . .	3.0	4.8	3.4	6.2	6.0
June . . . . .	2.4	3.2	3.5	6.6	11.0
July . . . . .	3.4	3.5	6.6	7.2	14.2
August . . . . .	4.8	4.7	12.3	5.5	6.7
September . . . . .	5.8	7.6	17.4	8.4	5.7
October . . . . .	12.6	16.5	15.6	6.6	6.0
November . . . . .	14.1	16.9	12.1	8.5	7.0
December . . . . .	14.5	13.4	9.0	9.4	7.9

The seasonal variations in the production of 8 economic groups of sea-fish along the above strips of coastline may be seen in Appendix V.

(b) *Freshwater fish*.—The seasonal factor is quite pronounced in freshwater fishing also, but here the causes are somewhat different. In the large rivers of Northern India, there is generally not much fishing during the rains, and the season begins in October with the subsidence of floods. Fishing is the main occupation of only a few people in the inland tracts. During April to September, in most parts of India, the villagers including professional inland fishermen, find other

more profitable avocations, such as harvesting of wheat, sowing of cotton, etc. Besides, the demand for fish in the plains is small during the summer months. Hence during the summer and the monsoon months, fishing is generally poor in most parts of the Punjab, the United Provinces and Central India.

Tanks, on the other hand, are best fished when the water level is low. In Madras, Central Provinces and Hyderabad State, the chief source of supply is tanks and the largest quantities are landed during April to July.

In the inland tracts generally speaking, climatic conditions determine the demand. Wide variations occur from province to province and even from district to district in the same province, as will be seen from the following table:—

*Availability of fish in certain areas.*

—	Gorakh-pur (U. P.)	Unao (U. P.)	Jhansi (U. P.)	Hyderabad and Secunderabad (Hyderabad State)	Mettur* (Stanley reservoir)	Baroda City.	C. P. and Berar. †	Bihar. ‡	Punjab. §
January . . .	10.3	13.3	6.2	1.5	12.8	12.0	10.0	17.6	5.9
February . . .	10.6	11.6	6.1	1.5	17.4	7.8	8.5	13.0	2.2
March . . .	9.4	11.2	5.2	1.6	8.0	8.6	8.0	10.8	1.3
April . . .	8.9	8.9	6.0	37.5	7.0	7.7	9.0	10.3	2.7
May . . .	7.0	7.5	6.7	37.4	7.6	7.6	9.0	11.5	1.7
June . . .	6.5	3.5	14.8	5.8	5.9	5.5	8.5	5.1	2.6
July . . .	6.4	0.8	14.4	4.7	3.3	6.2	11.0	2.9	10.8
August . . .	5.2	0.9	13.5	2.7	4.7	6.9	7.0	2.0	16.4
September . . .	6.8	1.4	12.4	2.7	5.8	6.7	6.2	2.0	18.7
October . . .	8.7	12.3	4.0	1.6	6.7	8.4	7.3	5.0	15.8
November . . .	10.0	12.8	4.8	1.5	10.8	12.2	7.2	7.6	12.4
December . . .	10.2	15.9	5.0	1.5	10.0	10.4	8.3	12.2	9.5

(6) TREND OF PRODUCTION.

In the absence of regular fish statistics, it is difficult to examine the trend of fish production in India. The quantities of fish landed along the west coast of the Madras Province during the period 1929-30 to 1938-39 may, however, give some rough idea of the trend.

Year.	Total catch (thousands of maunds).	Percentage variation from catch landed in 1929-30.
1929-30	3,257.5	..
1930-31	1,640.4	-49.5
1931-32	5,400.6	+66.1
1932-33	3,133.4	-3.8
1933-34	3,306.8	+4.3
1934-35	2,460.1	-24.5
1935-36	3,666.2	+12.5
1936-37	3,189.0	-2.1
1937-38	2,468.1	-24.2
1938-39	2,001.5	-38.6

The quantities of eight economic groups caught during the above years are given separately in Appendix VI. A comparison of the figures indicate the wide variations from year to year in the total catch as well as in the different groups that make up this total. It is possible that similar fluctuations take place in the other strips of the Indian coastline as well.

\* Based on monthly collections from issue of licences for fishing in the Stanley Reservoir.

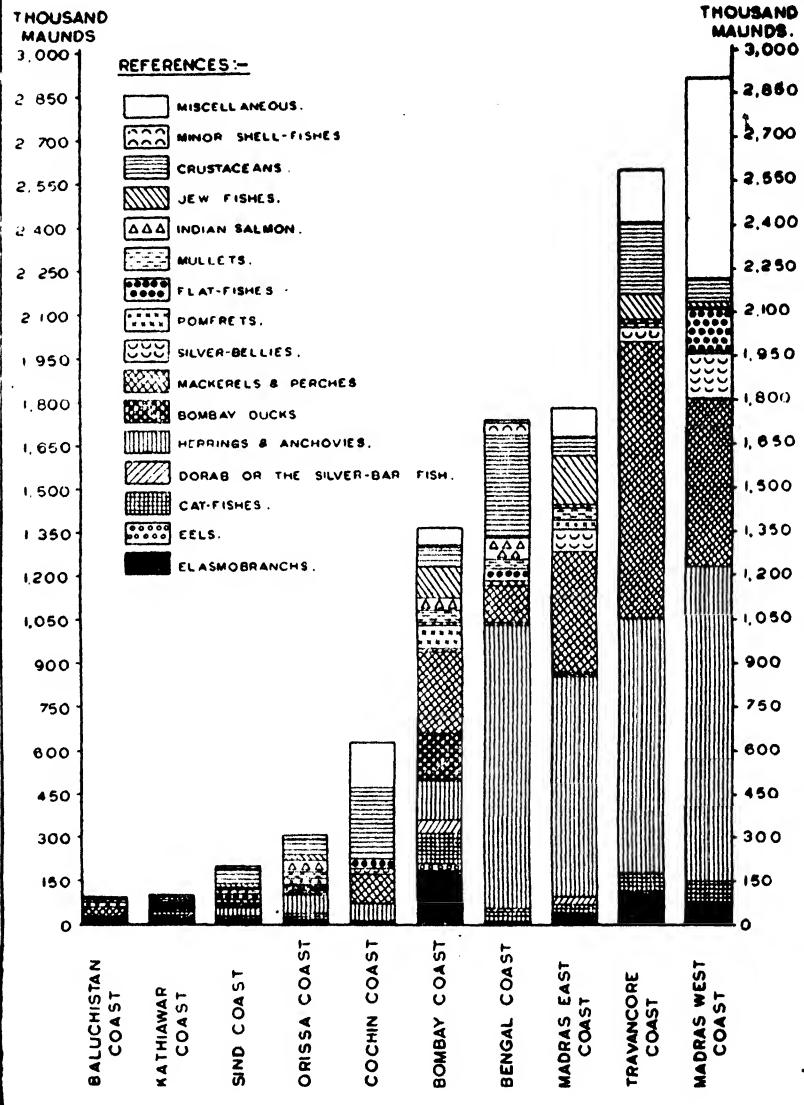
† Hoshangabad, Jubbulpore, Bilaspur, Pauni, Ramtek and Kamptee.

‡ Exports from certain principal stations in Bihar.

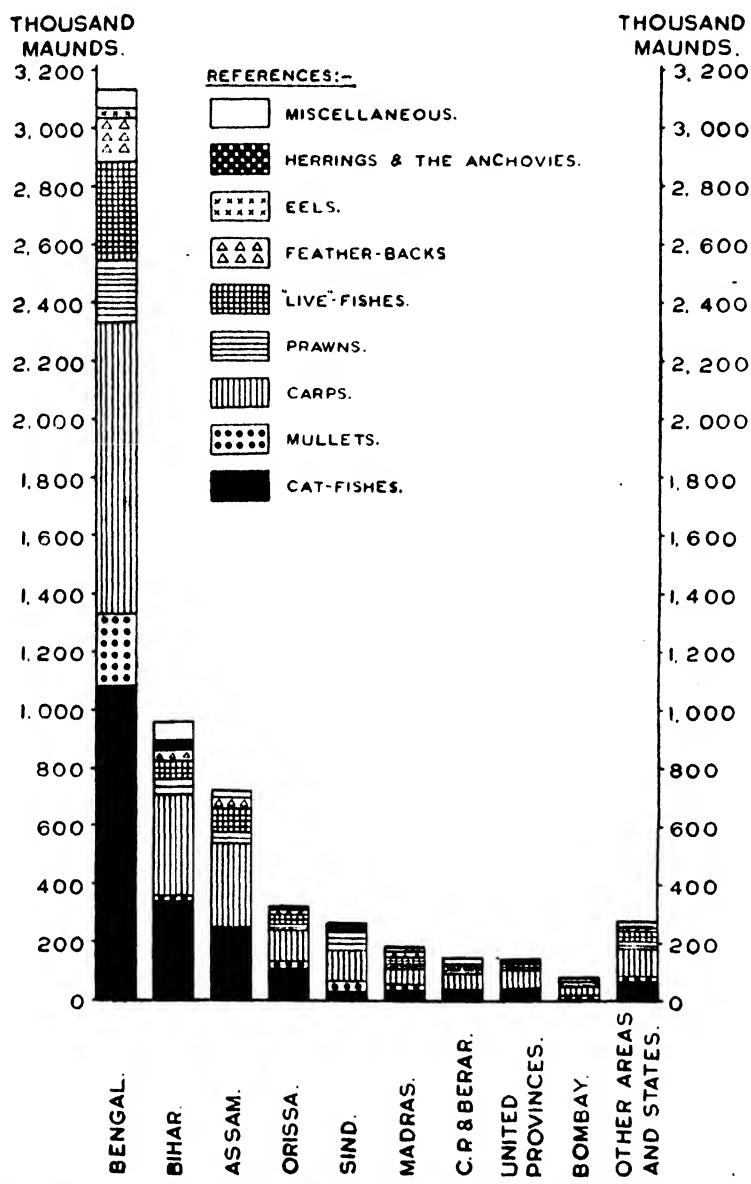
§ Lahore, Rawalpindi, Simla, Jullundur, Ambala, Sialkot and Amritsar.

¶ Compiled from "Fish Statistics"—Madras Fisheries Bulletin No. 27 (1937) for 1929-30 and 1930-31 and from unpublished data in possession of the Madras Fisheries Department for the remaining years. The financial year commences on 1st July.

## LANDINGS OF SEA FISH ACCORDING TO VARIETIES.



APPROXIMATE MARKETABLE SURPLUS  
OF FRESH WATER FISH.  
ACCORDING TO VARIETIES .



It will be observed further that the variations are very pronounced in the groups "Mackerels and perches" and the "Herrings and the Anchovies", the deviation from the average mean being +158 in 1931-32 and -74.1 in 1937-38 in the former and +372.5 in 1934-35 and -83.6 in 1935-36 in the latter.

Variations in the quantities of fish landed from year to year are not peculiar to India. Such variations occur in almost every country. Favourable spawning conditions during one year ensure a good fishery after a definite interval, two years or three years as the case may be, depending upon the period of maturity of the fish. The fluctuations are to be attributed to events which happen in the early months of the fish's life and to the manifold perils, meteorological, physico-chemical and biological, to which the eggs and larvae of a marine animal are subject.\*

As data regarding the number of persons engaged in the industry over a number of years, the number of boats, the amount of business in the fish curing yards, etc., are not available, it is difficult to say whether the industry has increased in size or not. The census figures regarding the percentages of the fishing population to the total population of the country cannot be completely relied upon, as there have been considerable changes in census classification of "Occupation". The only conclusion that can be drawn from the census figures is that the fishing population has grown with the general population. The number of fishing boats, especially vessels under three tons, has increased, but only in the above ratio. The volume of business transacted in the fish-curing yards has been more or less stationary and the yard statistics do not show that there has been any increase in the size of the industry. As regards subsidiary industries, no development in canning, pickling or in the manufacture of fish meal has taken place. It would, therefore, appear that as far as sea fisheries are concerned, the industry has made very little progress in recent years.

Regarding freshwater fish, no figures are available which can illustrate the trend of production. The increase of population has undoubtedly increased the demand for fish, while the opening of railways has led to freer and more profitable distribution. But the consensus of opinion everywhere is that the inland fisheries are rapidly deteriorating. Taking India as a whole, a progressive decline is believed to be taking place in the production of freshwater fish due to:—

- (a) The construction of dams and weirs over the main rivers which obstruct the migratory fish from reaching their customary spawning grounds;
- (b) Gradual silting up of rivers;
- (c) Reclamation of jhils and other fishery areas owing to the increasing pressure of population;
- (d) Neglect of tanks and other sources of water supply consequent on the development of better irrigation facilities;
- (e) Over-fishing; and
- (f) Destruction of fry and immature fish.
- (g) Pollution of streams and water ways in general.

#### (7) FISH RETAINED BY FISHERMEN AND OTHERS FOR DOMESTIC CONSUMPTION.

It is very difficult to determine with any degree of accuracy the amount of catch actually retained by the fishermen in the villages of any district or province.

Since there is a ready demand for fish in the urban areas, fishermen who operate near cities and towns, retain very little of the catch for their own use. In the rural areas, during the fishing season, many villagers take to fishing, and the fish so caught are always used for private consumption. In certain parts of Bengal and Assam, while the profession of fishing is considered to be derogatory, fishing as a pastime or for one's own consumption is not considered so.

The quantity retained by professional fishermen depends chiefly upon (1) the site of fishing, (2) the size of the catch, (3) varieties which constitute the catch, (4) the existence or otherwise of a fish curing yard in the neighbourhood and (5) transport available.

While marine fishermen catch fish within a distance of 5 miles on either side of their homesteads, freshwater fishermen have often to travel several miles along a river in search of fish. During such campaigns when parties of fishermen remain out for a number of days, a fair portion of the catch is used by them for their own consumption. When catches are large and plentiful, generous gifts are often made to friends and acquaintances as well.

The nature of the catch is often a deciding factor. If the catch consists of seer, pomfrets, perches, etc., in the case of sea-fish and rohu, mirgal, catla, etc., in freshwater fish, the fishermen generally keep the whole catch for sale. When the catch is mixed, the varieties which are in demand in the market are separated and, out of the rest, small-sized ones or coarse and bony varieties, are retained for consumption. If there is a fish curing yard in the neighbourhood, fish are sent to the yard for cure.

In the course of the present survey, a rough estimate was made of the quantities of fish actually retained by the fishermen for their own consumption. It was found that as regards sea-fish, out of a total production of 116.7 lakh maunds, 8.8 lakh maunds or 7.5 per cent. was retained by

\*S. Hemp: Address at the meeting of the British Association on "Oceanography and the fluctuation in the abundance of marine animals"—1938.

fishermen. In the case of freshwater fish 62.6 lakh maunds shown as being available represents the quantity that is actually offered for sale.

(8) IMPORTANT CENTRES WHERE FISH ARE LANDED OR ASSEMBLED.

Owing to the scattered nature of the fishing centres, special mention of a few important places having a good trade in this commodity appears desirable. At many of these places supplies could be increased by exploiting the resources more intensively or by importing from adjacent areas. The survey has disclosed that markets are generally under-supplied almost everywhere. The *per capita* consumption figures worked out for different areas (see pages 42 and 43) also show the inequality of consumption. The four months of the monsoons are usually a period of fish-famine, particularly in areas which draw their supplies from the sea. During these months, none of the large coastal towns get the quantities of fish which they require. Full particulars are given in Appendix VII. The figures given in this Appendix would indicate that there are good prospects of developing the fishing industry on scientific lines by setting up cold storage installation (for fresh fish) and better processing yards (for cured fish and fish products). Places like Malvan, Malpe, Tanur and Uppada indicated in the Appendix are a few of the producing centres from which fish could be imported in increasingly large quantities by the neighbouring cities and towns in the same manner in which Narsik and Vizhingom supply the neighbouring Ernakulam and Trivandrum markets, and Gopalpur and Kaluparaghath supply the Calcutta market.

B.--Imports of fish and fish products into India.

(1) TOTAL QUANTITY AND VALUE.

There is practically no import of raw fish into India, imports of fresh European or Canadian fish brought in cold storage in ships being negligible. But considerable quantities of preserved fish, *viz.*, dried fish (salted or unsalted), wet-salted fish, canned fish, etc., and fish products such as cod-liver oil, fish manure, are imported. Compared with the value of fish caught in India (Rs. 10.2 crores) the value of the imported products is Rs. 16.3 lakhs or only 1.6 per cent. of the former. Most of the imports of preserved fish, excepting canned fish, are from the neighbouring countries, chiefly Muskat Territory, Trucial Oman and other Native States in Arabia. Against this, there is an annual export trade valued at about Rs. 75 lakhs (average of 5 years ending 1939-40).

At present statistics regarding imports of fish and fish products are classified under five main groups, *viz.*, (i) total fish, excluding canned fish, (ii) canned fish, (iii) cod-liver oil, (iv) fish or whale oil hardened and (v) fish manure. The first group comprises (a) fish, dry, unsalted, (b) fish, dry, salted, (c) fish maws and shark fins, (d) fish, wet, unsalted and (e) fish, other sorts. Till 1933-34, fish oil was reported separately under "Animal oils", but after that year it has been combined with hardened whale oil and the classification is as above. These products are all imported by sea. The following table gives the average annual imports of the different products together with their value for the 12 year period ending 1940-41.

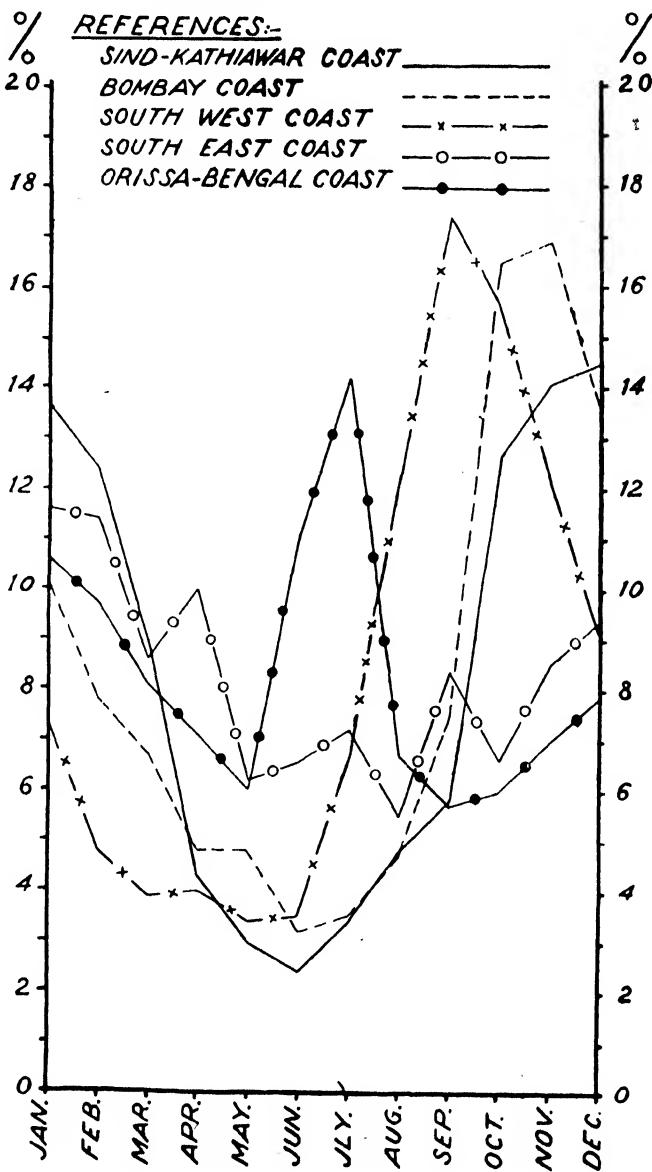
*Imports of fish and fish products into India.*

	Average for 12 years ending with 1939-40.			1940-41.*		
	Quantity.	Value.	Import price per cwt.	Quantity.	Value.	Import price per cwt.
Total fish excluding canned fish . . .	Cwt.	Rs.	Rs. A. P.	Cwt.	Rs.	Rs. A. P.
Canned fish . . .	61,747	5,46,623	8 13 8	1,10,516	6,61,030	5 15 9
Cod-liver oil . . .	10,576	5,42,444	51 4 8	10,153	5,93,480	58 7 3
Fish or whale oil hardened . . .	1,244	81,886	65 12 8	1,783	1,84,907	103 11 4
Fish manure . . .	23,272	3,27,948	14 1 6	..	..	..
	43,537	1,36,115	3 2 0	77,340	1,23,899	1 9 8
Total . . .	1,40,876	16,34,968	..	1,99,792	15,53,316	..

\* During 1940-41, there were no imports of "Fish or whale oil hardened". In the previous year 1,183 cwt. valued at Rs. 24,500 were imported.

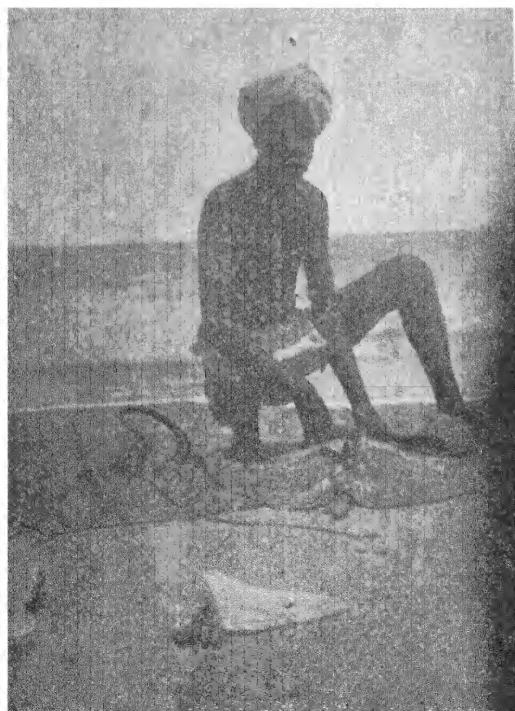
It will be observed that while the total quantity imported during 1940-41 is nearly 60,000 cwt. more than the average for the 12 years, the value of imports has shown a decrease from Rs. 16.3 lakhs to Rs. 15.6 lakhs. As the various products hail from different countries and show different trends, each type of product is discussed separately below.

**MONTHLY VARIATION IN THE CATCH OF  
SEAFISH ALONG FIVE STRIPS OF  
INDIAN COAST-LINE.**





BRINGING THE CATCH ASHORE.



GUTTING A RAY.

## (2) IMPORTS OF PRESERVED FISH, EXCLUDING CANNED FISH.

(a) *Trend.*—The position regarding the imports of preserved fish excluding canned fish may be seen in Appendix VIII, which gives the quantities of dried fish, wet and dry salted fish, fish maws and shark fins, and "fish, other sorts", imported into India during 5 years ending 1940-41. The quinquennial averages of the above are given in the table below:—

Imports of preserved fish into India.

	Average for the quinquennium ending 1940-41.		
	Quantity.	Percentage to total imports of preserved fish.	Cost per cwt. Rs. A. P. £
		Cwt.	
Fish, dry, unsalted . . . . .	44,264	46.4	3 7 7
Fish, dry, salted . . . . .	2,486	3.3	7 15 10
Fish maws and shark fins . . . . .	5,292	7.5	6 7 6
Fish, wet salted . . . . .	29,587	38.9	9 10 9
Fish, other sorts . . . . .	2,767	3.9	57 10 2
Total . . . . .	84,396	100.0	...

It will be seen that dried unsalted fish and wet salted fish are imported in considerable quantities. Canadian salmon, haddock, kippers and similar products from America and the United Kingdom, are classified under the miscellaneous heading "Fish, other sorts": hence the high import cost per cwt.

The imports, except "Fish, other sorts", show a steadily rising trend. In the case of "Fish dry unsalted", the increase in imports registered during 1937-38 over the previous year has been remarkable. A large increase has taken place during 1940-41 also. Dried fish accounted only for 6.8 per cent. of the total imports in 1936-37. It rose to 45.9 in 1937-38 and in 1940-41 stood at 67.0 per cent. The cost per cwt. rose from 3.12-4 in 1936-37 to Rs. 4.4-9 in 1937-38 but declined thereafter and was Rs. 2.15-6 in 1940-41. The imports of dry salted fish have always been small. There was a sharp fall in imports during 1940-41 and the import cost per cwt. appreciated from Rs. 7.10-1 to Rs. 10.11-3. "Fish maws and shark fins" shows a steady trend as regards quantities imported, but the import prices have been erratic. Wet salted fish accounts for nearly 40 per cent. of the total imports. Unlike dried unsalted fish, the trend of imports has been steady in this case, although during 1940-41, there has been a slight fall accompanied with a little appreciation in price. Till 1940-41, imports of miscellaneous fish products (excluding canned fish), remained steady at about 3,000 cwt. per year with the import price ranging between Rs. 51 and Rs. 54 per cwt. Probably on account of the scarcity of shipping—these products generally arrive from Europe and America—the imports registered a sharp decline in 1940-41 and the price per cwt. rose from Rs. 55 to Rs. 74 during the year.

(b) *Periodicity.*—The monthly variations in the quantities of preserved fish imported into India may be seen in Appendix IX. The monthly periodicity of imports and the seasonal variation in the production of fish along the Arabian sea coast of India are very similar. This is due to the fact that preserved fish is brought from Arabia in sailing vessels. The Arabian sea is navigable by sailing craft only during the fair weather season: and this is exactly the time when fishing centres along this coast remain busy. Large steamers which bring fish from Europe and America and which land their cargo in harbours which are open all through the year are not exposed to the vagaries of the weather conditions as sailing ships are, and this partly accounts for the uniform distribution of imports of "Fish, other sorts" during the different months of the year. It will be observed that imports are high during the nine months, September to May: this is followed by a sharp decline during the monsoon months, the minimum being touched in July.

(c) *Sources.*—The countries of origin and their importance are shown in the table below:—

*Countries consigning preserved fish for import into India.*  
(Percentages to total by weight.)

Name of the country from whence imported.	1935-36.	1936-37.	1937-38.	1938-39.	1939-40.	Quinquennial average.
<b>Empire Countries—</b>						
United Kingdom .	5.3	7.0	4.1	3.0	2.6	3.8
Ceylon . .	1.3	1.3	0.2	0.4	1.1	0.8
Burma* . .	4.6	2.8	5.4	2.7	0.4	2.9
Other British Possessions . .	0.8	3.3	0.2	0.9	0.6	0.9
Total . .	11.9	14.4	9.9	7.0	4.7	8.4
<b>Foreign Countries—</b>						
Muscat Territory and Trucial Oman	62.3	59.2	68.6	72.9	72.7	69.1
Other Native States in Arabia . .	18.9	24.8	18.4	10.5	20.1	17.5
Iran . .	0.7	0.6	2.6	4.1	2.1	2.4
Other Foreign Countries . .	6.2	1.1	0.5	5.5	0.4	2.6
Total . .	88.1	85.6	90.1	93.0	95.3	91.6
Total quantity imported into India. Cwt.	42,295	39,801	76,370	94,290	101,004	70,752
Value of imports. Rs.	4,39,834	4,43,912	6,70,266	6,89,144	7,29,514	5,94,538

\*Burma was separated from India in 1937. Till then figures of imports and exports were combined in the sea borne trade accounts. These have been sorted out, but so far as the countries of origin or destination are concerned as only joint figures were available, the percentages in some cases are only approximate.

It will be observed that the bulk of the imports comes from the adjoining countries, mainly Muscat Territory and other Native States in Arabia.

On an average, 50 per cent. of the imports are landed in Bombay ports, 30 to 40 per cent. in Sind and 10 to 15 per cent. in the different ports along the west coast of the Madras Province.

(3) CANNED FISH.

Canned fish consumed in India are wholly imported. There are various brands such as salmon bloaters, sardine in oil, herring roes, etc., in the market and in this classification are also included products like fish pastes, bottled shrimps and canned crabs and oysters. The trend of imports of the above is shown in the following table:—

*Imports of canned fish into India.*

Year.	Quantity.	Value.	Import cost per cwt.
	Cwt.	Rs.	Rs. A. P.
1929-30 . . . . .	9,491	5,92,473	62 6 10
1930-31 . . . . .	10,976	6,35,480	57 14 4
1931-32 . . . . .	6,478	3,52,630	54 7 0
1932-33 . . . . .	7,661	3,90,071	50 15 9
1933-34 . . . . .	10,413	4,82,951	46 6 1
1934-35 . . . . .	10,696	4,97,353	46 8 0
1935-36 . . . . .	12,669	5,70,135	45 0 1
1936-37 . . . . .	11,118	5,32,259	47 14 0
1937-38 . . . . .	12,850	6,30,310	49 0 10
1938-39 . . . . .	13,249	6,37,182	48 1 6
1939-40 . . . . .	11,164	5,94,996	53 4 9
1940-41 . . . . .	10,153	5,93,480	58 7 3
Average for the above 12 years . . . . .	10,576	5,42,443	..

It will be observed that the quantity imported has remained fairly steady, except in one or two years.

The monthly imports of canned fish are shown in the following table:—

*Monthly imports of canned fish.*

(Average for four years ending 1939-40.)

Months.	Weight in cwt.	Percentage to total by weight.
January . . . . .	1,414	11·9
February . . . . .	1,141	9·6
March . . . . .	1,249	10·5
April . . . . .	1,428	12·0
May . . . . .	984	8·3
June . . . . .	657	5·5
July . . . . .	565	4·7
August . . . . .	883	5·6
September . . . . .	790	6·6
October . . . . .	797	6·7
November . . . . .	890	7·5
December . . . . .	1,316	11·1
Total . . . . .	11,894	100·0

The imports are high during the five months (December to April) when there is a general increase in the demand for fish all over India. Canned goods are not perishable in the sense in which cured or dried fish are, and the imports coming in ocean-going steamers and landed in the large ports show, a more uniform distribution over the different months than is the case with other types of preserved fish.

The shares of the various consigning countries can be seen in the following table:—

*Countries despatching canned fish to India.*

(Percentage to total by weight.)

Name of the country from whence imported.	Average for the quinquennium ending March 1940.	1939-40.
<i>Empire Countries—</i>		
United Kingdom . . . . .	28·2	19·6
Canada . . . . .	20·5	30·7
Other British Possessions . . . . .	0·4	0·5
Total . . . . .	58·1	50·8
<i>Foreign Countries—</i>		
Japan . . . . .	10·2	14·7
United States of America . . . . .	20·6	25·7
Norway . . . . .	7·6	6·5
Portugal . . . . .	1·1	0·5
Other Foreign Countries . . . . .	2·4	1·8
Total . . . . .	41·9	49·2
<b>Total quantity imported . . . . . Cwt.</b>	<b>12,210</b>	<b>11,164</b>
<b>Total value of imports . . . . . Rs.</b>	<b>5,92,978</b>	<b>5,94,906</b>

It will be observed that nearly 60 per cent. of the imports are from the Empire countries (30 per cent. each from the United Kingdom and Canada) and 40 per cent. from the foreign countries. Of the latter, nearly half is from the United States of America, and one quarter from Japan. The exports from Norway consist wholly of herrings in oil and as much as 7 per cent. of the total imports consist of " Norwegian herrings".

(4) COD-LIVER OIL.

Cod-liver oil is a medicinal product and is imported into India in the raw condition as also in the form of emulsions and patent medicines. The Customs returns show only the imports of raw cod-liver oil separately. The trend of imports has been steadily on the increase since 1929-30. The

maximum was touched in 1938-39 when 2,505 cwt. valued Rs. 1,33,650 was imported. The import price per cwt. shows an erratic trend: generally, when imports are high, the price is low. There are different brands of cod-liver oil in the market, which possess varying potencies as regards medicinal properties. As the cost per cwt. depends on the quality of the oil, the variations in import price per cwt. may be due to the varying proportions of high and low grade oils in the total quantity imported into this country. Contrary to general belief, these imports have not been very adversely affected by the outbreak of the War in 1939.

*Periodicity of imports.*

(Average of 4 years ending 1940-41.)

	Cod-liver oil.		Fish or whale oil hardened.		Fish manure.	
	Quantity.	Percentage to total.	Quantity.	Percentage to total.	Quantity.	Percentage to total.
January . . . . .	Cwt.		Cwt.		Cwt.	
January . . . . .	143	7.4	138	5.2	5,025	10.7
February . . . . .	127	6.6	280	10.9	5,725	10.9
March . . . . .	220	11.4	548	20.7	5,430	10.3
April . . . . .	229	11.9	268	10.1	4,885	9.3
May . . . . .	184	9.5	281	10.6	6,660	12.7
June . . . . .	200	10.4	32	1.2	2,735	5.2
July . . . . .	140	7.2	157	5.9	350	0.7
August . . . . .	143	7.4	134	5.1	1,980	3.8
September . . . . .	161	8.3	100	4.1	4,440	8.5
October . . . . .	127	6.6	215	8.1	5,085	9.7
November . . . . .	139	7.2	304	11.5	4,360	8.3
December . . . . .	118	6.1	174	6.6	5,210	9.9
	Total . .	1,931	(100)	2,649	(100)	52,485
						(100)

It will be observed from the above table that the imports are more or less uniformly distributed over the months.

The share of the different countries consigning cod-liver oil for import into India is given in Appendix X. It will be observed that almost two-thirds of the imports are from Norway. The share of the United Kingdom has been steadily increasing from 14.3 per cent. in 1935-36 it has increased to 24.5 per cent. in 1939-40. Germany and the Netherlands also consign small quantities of cod-liver oil, and in all 80 per cent. of the average imports are from foreign countries.

**(5) FISH OR WHALE OIL HARDENED.**

Comparable figures are available only from 1933-34. The entire quantity of fish oil and the bulk of the hardened whale oil are used in industries. The table below shows the trend of imports:—

*Trend of imports of hardened whale oil.*

Year.	Quantity imported.	Value.	Cost per cwt.		
			Cwt.	Rs.	Rs. A. P.
1934-35 . . . . .	18,559	2,19,001		11 12 4	
1935-36 . . . . .	17,597	2,33,217		14 13 3	
1936-37 . . . . .	9,240	1,36,980		14 13 1	
1937-38 . . . . .	5,415	94,014		17 5 9	
1938-39 . . . . .	3,733	58,013		15 8 8	
1939-40 . . . . .	1,183	24,500		20 11 2	
1940-41 . . . . .	No imports	..		..	

It will be observed that the quantity imported has been steadily declining and in 1939-40 was only 6.4 per cent. of what it was in 1934-35. During in 1940-41, there were no imports at all.

**(6) FISH MANURES.**

India is an exporting country as far as fish manures are concerned. But, on an average, 43,000 cwt. of fish manure are obtained annually from outside (see Appendix X). The quality is often

very poor and the cost is about Rs. 2 per cwt. against an average of Rs. 4-8-0 fetched by the Indian produce.

It will be seen further from Appendix X that almost the entire quantity is obtained from Muskat Territory and other Native States in Arabia. The bulk of the imports is absorbed in Sind. As in the case of preserved fish (excluding canned fish), the imports are during the months when sailing crafts are able to come across the Arabian Sea to India (see Appendix IX and page 21).

### C.—Exports of fish products from India.

#### (1) TOTAL EXPORTS.

Certain maritime provinces and States have built up an export trade in preserved fish to Ceylon, Burma and countries in the Far East. The table below indicates the average quantities and values of Indian exports for 9 years ending 1940-41, together with their position during the year 1939-40:—

*Exports of fish products from India.*

Products.	Average for 9 years (1932-33 to 1940-41).			1939-40.		
	Quantity.	Value.	Export price per cwt.	Quantity.	Value.	Export price per cwt.
				Cwt.	Rs.	Rs. A. P.
Preserved fish . .	353,238	74,18,441	21 0 0	357,502	69,70,734	19 8 0
Fish manure . .	95,651	4,06,294	4 4 0	124,240	5,79,726	4 10 8
Total . .	..	78,24,735	..	..	75,50,460	..

It will be observed from the above that the quantity of preserved fish exported has remained remarkably steady, but the value of exports declined in 1939-40 when compared with the average for the nine years.

The exports depend, to a certain extent, upon the nature of the fishing season along the south-west coast of India, a favourable season resulting in increased despatches. This is especially the case with fish manure. Exports of fish manure have been steadily increasing since 1933-34: in 1940-41 it was more than thrice the quantity that was sent out in former year.

The drying or curing methods adopted depend upon the requirements of the export market, and are quite different from those adopted in the case of fish intended for consumption within the country. Consequent on the out-break of hostilities in the Pacific and Indian Oceans, India has lost all her export markets except Ceylon.

#### (2) EXPORTS OF PRESERVED FISH.

The quantity of preserved fish exported from India during the period of 5 years ending 1940-41 are given separately in Appendix XI. The quinquennial averages of the above can be seen in the following table:—

*Exports of dried fish, salted and unsalted fish and fish maws and shark fins from India.\**

	Average for the quinquennium ending 1940-41.		
	Quantity.	Percentage to total export.	Export price per cwt.
Fish, dry, unsalted . .	199,824	56.5	20 10 9
Fish, dry, salted . .	141,587	39.7	16 10 1
Fish maws and shark fins . .	5,840	1.7	88 9 7
Fish, wet-salted . .	7,394	2.1	8 2 3
Total preserved fish . .	354,646	(100)	..

\* Excludes exports from Kathiawar ports.

It will be seen from Appendix XI that while the total exports have remained more or less steady during the 5 years period ending 1940-41 it has remained so during the past several years—the different products which constitute this total have shown varying trends. A significant change has been a steady decline in the quantity of dried unsalted fish sent out of this country. The export price per cwt. has been erratic and generally on the downward grade; "fish maws and shark fins" particularly has registered a sharp and steady decline in value. There is no regularity in regard to the monthly despatches. Exports are, however, high during the seven months, September to March. August is the month of minimum exports. (See Appendix XII.)

As regards wet-salted or pickled fish, it is produced in small quantities in some yards on the west coast for export to Ceylon. The production as well as the exports of this commodity are high during the four months, December to March, when mackerels of suitable size are available (see Appendix VII).

The destinations of Indian exports and the shares of the ports handling the trade are given in the following table:—

*Shares of countries importing preserved fish from India.*

—	1935-36.	1936-37.	1937-38.	1938-39.	1939-40.	Quinquennial average.
Total quantity exported (cwt.)	395,112	395,404	338,524	335,968	357,502	364,502
Importing countries—						
Ceylon . . .	64.1	67.3	67.4	65.8	66.3	66.1
Burma . . .	33.1	30.5	29.5	30.9	29.7	30.8
Other Empire Countries.	2.6	2.0	2.8	2.9	3.8	2.8
Foreign Countries .	0.2	0.2	0.3	0.4	0.2	0.3
Total . .	(100)	(100)	(100)	(100)	(100)	(100)
—	Percentage to total.	Average for the triennium ending 1939-40. Percentage to total.				
Exporting ports in—						
Madras . . .	..	..	75.8	76.6	70.5	74.3
Bombay . . .	..	..	4.4	3.8	6.9	5.0
Bengal . . .	..	..	5.3	4.8	5.9	5.3
Sind . . .	..	..	14.6	14.8	16.7	15.3
Orissa . . .	..	..	Neg.	..	Neg.	0.1
Total . .	..	..	(100)	(100)	(100)	(100)

It will be observed that Ceylon is the principal buyer, the average of her share during the quinquennium ending 1939-40 being 66.1 per cent. Burma comes next with 30.8 per cent. The remainder of the exports is taken by Straits Settlements, Hong Kong, etc., in small quantities. A significant feature is that 90.7 per cent. of the exports are to Empire countries in the East which lie near India.

Among the exporting provinces, Madras stands first because sea-fishing is best developed in that province and in other areas near it, e.g., Travancore and Cochin States. Her share stands at 75 per cent. Next in importance is Sind, where also the industry is fairly well concentrated. Bengal ports send fish chiefly to Burma.

## (3) FISH MANURE.

The following table shows the trend and the destinations of the exports of fish manure from this country during the 5-year period ending 1939-40:—

Exports of fish manure from India.

—	1935-36.	1936-37.	1937-38.	1938-39.	1939-40.	Quinquennial average.
Quantity exported in cwt.	94,920	104,320	127,960	94,200	124,240	109,128
Value of the exports in rupees	3,73,327	4,03,637	5,59,178	3,79,374	5,79,726	4,59,045
Cost per cwt. Rs. A. P. .	3-14-11	3-13-11	4-5-11	4-0-5	4-10-8	4-3-4
Countries to which exported.	Percentage to total by weight.					
(a) British Empire .	85·4	85·2	88·3	99·6	97·4	91·3
(1) United Kingdom	3·3	4·0	14·1	6·4	4·8	6·9
(2) Ceylon . .	82·1	81·2	73·8	91·2	87·1	82·7
(3) Other British Possessions .	..	..	0·4	2·0	5·5	1·7
(b) Foreign Countries	14·6	14·8	11·7	0·4	2·6	8·7
(1) Belgium . .	11·5	12·2	6·0	0·4	2·6	6·4
(2) Italy . .	2·1	..	4·5	..	..	1·4
(3) Other Foreign Countries . .	1·0	2·6	1·2	..	Neg.	0·9
Total . .	100·0	100·0	100·0	100·0	100·0	100·0

In general the exports of fish manure from India have been on the increase (in quantity as well as in value). Ceylon purchases, on an average, over 82 per cent. of the exports of fish manure from India. The next important buyer is Belgium, but her intake has been steadily declining during recent years. The rest of the exports is taken by United Kingdom and Italy in small quantities.

The shares of the main ports of consignment are given in the following table:—

Name of the ports in :—	1936-37.	1937-38.	1938-39.	1939-40.	Per cent.	Per cent.	Per cent.	Per cent.
					10	..	..	..
Bengal . . . . .	..	..	..	..	..	..	..	..
Bombay . . . . .	..	..	..	..	..	..	..	..
Sind . . . . .	81·5	87·1	96·7	83·7	87·1	96·7	83·7	87·1
Madras . . . . .	17·5	10·1	3·3	16·3	10·1	3·3	16·3	10·1
Total . .	(100)	(100)	(100)	(100)	(100)	(100)	(100)	(100)

It will be seen from the above that the Sind ports (mainly Karachi) handle the bulk of the export trade. The minor ports of the west coast of the Madras Province (Mangalore, Tellicherry and Cannanore) handle about 15 per cent. of the exports. The shares of Bombay and Bengal amount practically to nothing so far as fish manure is concerned.

## D.—Re-exports of fish products from India.

The re-exports of fish products from this country are insignificant when compared with the quantities of Indian produce that are exported. Canned fish is not re-exported. In the customs

returns only consolidated figures for "Total fish, excluding canned fish" are available. In the following table the quantities of foreign merchandise handled by all the Indian ports during the 5-year period commencing from April 1936 are given:—

*Re-exports of fish, excluding canned fish, from India.*

—	1936-37.		1937-38.		1938-39.		1939-40.		1940-41.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
	Cwt.	Rs.	Cwt.	Rs.	Cwt.	Rs.	Cwt.	Rs.	Cwt.	Rs.
April .	128	3,345	169	14,284	111	7,939	46	9,200	9	310
May .	261	16,775	166	14,056	354	40,180	86	3,165	..	..
June .	165	9,330	110	3,360	36	2,600	139	5,500	..	..
July .	..	..	77	2,500	42	4,200	41	6,229	9	650
August .	58	7,887	74	2,134	215	12,490	..	..	..	..
September.	72	10,700	..	..	..	..	102	12,010	..	..
October .	55	4,189	60	13,100	25	1,750	..	..	5	70
November .	42	3,320	84	7,200	68	8,795	..	..	4	86
December .	157	15,923	154	20,890	82	5,762	..	..	..	..
January .	52	7,150	5	60	161	14,800	94	2,405	37	1,500
February .	315	20,127	380	29,770	112	9,880	41	197	25	1,000
March .	203	17,359	469	33,290	113	10,160	..	..	25	1,845
Total .	1,508	1,25,105	1,766	1,40,644	1,319	1,18,556	549	38,766	114	5,461

It will be seen that only 1,051 cwt. or 1·6 per cent. of the total imports are re-exported from this country. In terms of value, however, this represents nearly 13·5 per cent. of the total imports. This indicates that some of the imported products, possibly "Fish-maws and shark fins", are re-exported from India at much above the import price.

Re-exports are on the decline and the quantities re-exported have come to negligible proportions during 1939 and 1940. It is not possible to say whether this is due to the outbreak of the War, as information regarding the stuff that is actually re-exported and the destinations of the exports are not known.

#### E.—Total and net available supplies in India.

The tables below give the total and net available supplies of fish and fish products in India:—

##### (a) Fresh fish.

	Sea-fish.		Freshwater fish.	
	Quantity (in lakhs of maunds).	Value (in lakhs of rupees).	Quantity (in lakhs of maunds).	Value (in lakhs of rupees).
Gross landings . . . . .	116·7	302·7	..	..
Quantity retained by fishermen . . . . .	8·8	22·8	..	..
Net available supply . . . . .	107·9	279·9	62·6	742·3

It will be seen from the above that the estimated quantities of sea and freshwater fish marketed in India are 107·9 and 62·6 lakh maunds respectively, the aggregate value being Rs. 1,022·2 lakhs.

(b) *Imports and exports of fish products.*

The averages for the quinquennium ending 1940-41 relating to the various types of fish products imported into and exported from India, as classified in the customs returns, are given in the following table :—

	Imports.		Exports.	
	Quantity.	Value.	Quantity.	Value.
<b>IMPORTS AND EXPORTS.</b>				
1. Fish Products.—	Cwt.	Rs.	Cwt.	Rs.
(a) Fish, dry, unsalted . . . . .	44,264	1,46,576	199,825	41,21,378
(b) Fish, dry, salted . . . . .	2,486	18,820	141,597	23,40,920
(c) Fish maws and shark fins . . . . .	5,202	33,104	5,840	5,00,558
(d) Fish, wet-salted . . . . .	29,587	2,87,235	7,394	54,138
(e) Fish, other sorts . . . . .	2,767	1,53,042	..	..
2. Canned fish . . . . .	11,797	5,97,645	..	..
3. Cod-liver oil . . . . .	1,703	1,02,126	..	..
4. Fish, oil, etc., hardened . . . . .	3,914	62,701	..	..
5. Fish manure . . . . .	42,900	1,01,929	116,228	5,03,520
Total . . . . .	..	15,03,178	..	75,20,503
<b>RE-EXPORTS.</b>				
Fish excluding canned fish . . . . .	..	..	1,051	85,706

In the absence of precise information regarding the various products traded in, it has not been possible to reduce these quantities into equivalent weights of fresh fish, and work out the net *available supplies*. As far as value is concerned, the balance of trade has been in favour of India to the extent of about 61 lakhs of rupees.

**CHAPTER IV.—PREPARATION FOR THE MARKET.****A.—General.**

Among the perishable foods fish is most liable to taint\* and is perhaps most poisonous when tainted. In the warm climate of the country, due to the combined action of bacteria\* and enzymes\*, the quality of the fish deteriorates very rapidly and ordinarily fish are unfit for human consumption eight hours after being caught, unless otherwise treated in the interval.

The marketable surplus of fish caught from rivers, tanks and other inland resources is almost wholly consumed as fresh fish. The preparation of such fish for inland markets in most parts of the country consists in merely removing the viscera, *viz.*, intestines, liver, heart, lungs, etc., and washing. In Bengal, however, consumers insist on round fish.

Regarding sea fisheries the position is different. The industry is scattered over a long coast line; fish supplies are irregular, the producers work on individualistic lines or in small groups and the quantity caught by each fisherman or a party of them is always small. The method of catching, the smallness of the boats, and certain established customs hinder the adoption of steps which could keep fish free from taint during transit from the moment of catching to the shore. The boats have often to stay for hours to get a sufficient catch during which time the fish heaped in them get trodden upon and are exposed to the full glare of the sun. Outside the comparatively high class markets in the coast and a few places scantily served with fish in ice, the supply of fresh marine fish in India is very largely tainted. The bulk of the sea fish are sun-dried or cured with salt and in this form reach consumers inland. On the other hand, one sometimes finds large shoals unexpectedly contacted and enormous catches being made. Moreover there are again a number of fish caught from the sea which are little utilized as food, either because of unfounded prejudice against them or of the ignorance of the general public regarding their quality. As a result, many varieties have to be converted into industrial products like manure, "guano", etc.

\* See glossary.

### B.—Methods employed regarding

#### (1) CATCHING.

Fishermen and others engaged in catching fish employ various types of boats and nets in the different provinces, the gear being adapted to the different conditions of weather, physical characteristics of the coast or water to be fished, etc. These have been discussed fully in Chapter II, "Fishing methods and gear", of this report.

#### (2) COLLECTING.

The fish caught are put in a heap in the boat or in a coir-net. Generally, boats land fish either early in the morning or after 4 o'clock in the evening, but if shoals are contacted, the boats get quickly filled and catches may come at any moment. At fishing sites which are served by rail, fishermen generally collect their catch to suit the local railway timings. The catches are handed over to the fisherwomen or to the middlemen who first sort the fish according to species and size and arrange for sale.

If fish could be rapidly collected from fishing sites and immediately transported to the urban coastal markets, a greater percentage of the catch would have been utilised as fresh fish. The use of motor "fish carriers" by the Bombay Government illustrates this in a striking manner. To augment the supply of fresh fish to the city, the scheme was inaugurated in 1933, and one power propelled boat was used to bring fish from adjacent fishing centres to the city. The field of operation quickly extended and within two years fishing centres 200—300 miles away from Bombay were being regularly visited. After Government had shown the way, the trade took it up. In 1938, the four carriers which the Government had constructed were purchased by private persons. By 1940, the number of carriers had increased to nine and the quantity of fish to 1,195,736 lb. against 2,662 lb. in 1933.

Great expansion of trade in estuarine and sea fish in Calcutta markets also resulted from the use of motor boats for transport purposes from 1929 till the commencement of the present War.

Fish carriers, however, are not new to this country. Middlemen in consuming markets have been and still are using sailing boats for collecting fish from boats in the sea. The limitations of a sailing boat for this work are obvious. The motor boat has the advantage of speed, freedom from the vagaries of weather and a greater cruising capacity. Properly equipped with an ice-room for stowing the fish and operated from a base where there is a local demand for fresh fish and where cheap ice as well as facilities for sending chilled fish by rail to distant markets are available, motor carriers should prove very successful. The use of carriers in the west coast of the Madras Province with bases, say, at Mangalore, Calicut and Cochin would result in the opening up of large markets for fresh sardines, mackrels and other varieties in the inland.

Freshwater fish are generally collected by the fishermen and despatched by the quickest means of transport. In Bengal, "live" fishes, which fetch a high price if sold alive and which are caught in bils and other confined waters, are collected and transported in the holds of boats, in water, over long distances. Carps are also transported alive in a similar manner. Certain estuarine varieties are towed to rail or steamer stations in *Hapars*, which are cylindrical split bamboo cages with a trap-door in the top. The quantities collected and transported in the live condition are, however, small.

#### (3) GUTTING AND CLEANING.

The process of removing the viscera is termed gutting. (See lower plate facing page 21.) This is generally accomplished by making a long cut along the dorsal or ventral line of the fish by means of a knife and pulling out the various organs by hand. Freshwater fish are gutted by fishermen as soon as the catch is landed. The operation is not done so promptly in the case of sea fish, although this is an essential preliminary to every kind of salting and drying process. Only large varieties ear-marked for transport to distant centres receive immediate attention. As the alimentary canal is the starting point of all putrefactive changes, the necessity for quickly removing this cannot be too sufficiently emphasised in a tropical country like India. Ordinary varieties are not gutted till they are on the point of entering the fish-curing or drying yards, i.e., about 5 to 6 hours after death. The gutted fish are seldom washed. The entrails are thrown about in a haphazard way. No attempts are made to utilize them as manure or even to dispose of them properly. Greater and more widespread use of fish carriers discussed in a previous section would result in considerable improvement in the methods of handling the fish. Where "carriers" cannot be introduced, fishermen should be induced to gut all varieties immediately after the catches have been landed. The provincial fishery authorities should take up this matter. When there is an organised attempt to gut and clean fish on the beach, it would not be difficult to salvage the inedible matter, which forms 15—20 per cent. of the raw weight, for use as a nitrogenous manure.

### C.—Preservation and curing of fish.

All the processes which inhibit or wholly arrest post-mortem changes in animal products, e.g., refrigeration, desiccation, pickling, smoking, the use of antiseptics, canning, etc., can be utilized for the preservation of fish.

## (1) REFRIGERATION.

The method of treatment differs according as whether the fish are to be preserved for one or two days only or for several days together. In the former case merely packing the fish with broken ice in a dealwood box would suffice. Saw dust or rice husk can be sprinkled over to prevent a too rapid melting of the ice. Fish intended for long storage have to be quickly frozen in special air-cooled chambers or with chilled brine\* glazed\* and stored at a low temperature.

There are about 270 ice factories operating in India and a ton of ice costs from Rs. 14 ex-factory in Bombay to Rs. 45 f. o. r. at stations in Malabar. These ice factories cater to the needs of the public for cooling soft drinks in the summer months. Enquiries show that there is only one factory (in the Bombay city) which manufactures ice specially for the fishermen and which does not put up the price of ice during summer months. In the inland, ice is used for keeping fish wholesome during transit to a distant market only, especially during summer. On the coasts at most fishing centres ice is hardly available.

There are about 50 cold storage installations, large and small, all over India, of which only one has special arrangements for freezing fish. When storage facilities are available near the sea-coast, the fish merchants keep baskets of fish, often packed with crushed ice (this is to prevent taint setting in till the fish gets cooled to the temperature of the storage room), in the chilled room of the cold storage. In the Bombay city, the Municipal Corporation has been operating a suitable chilled room within the Crawford Market, since 1923. Besides this, there are two similar installations in the city, one in the Sasson Docks where fish are actually landed. Only fish which remain unsold at the end of the market hours or which arrive too late to take part in the day's auction are kept in storage and the fish are taken out within 24 hours. The Bombay units have proved popular because fish are accepted for storage for one day at reduced rates. It might be profitable to instal similar storage rooms in all urban coastal markets, but they should be located either on the fish landing ghat or in the vicinity of the wholesale assembling market.

On the whole, fish freezing has a very limited scope for development in India. Frozen fish even in the best inland markets cannot be sold at more than Re. 1 a seer. With the average temperature at 90°F. the cost of freezing comes to about as much as the cost of fish and the price appreciates with storage. Storage cost in a cold store maintained at 10°F. may well amount to one anna per pound per week. Costly packing materials and the use of dry ice are necessary to maintain the temperature at 10°F. during transport and the cost at the consumer's end would increase proportionately with the distance.

## (2) CANNING.

At present there is practically no fish canning in India. There has been a considerable amount of public discussion as to the prospects of an Indian fish canning industry but no progress has been achieved yet. The demand for this canned fish is small and is met mostly by excellent imported European and American goods. It is doubtful whether any canning industry, if established for the canning of Indian fish, could compete with a reasonable chance of success in this specialized market. Europeans and Anglo-Indians who form the bulk of the consumers prefer tinned salmon or herring to any of the Indian varieties. Canned fish cannot be adapted to the Indian method of cooking. An average Indian prefers to cook his own food in his house than take something readymade and touched by "undesirable" hands. The experience of the Madras Government in running a fish cannery—this was located at Chaliyam (South Malabar) and worked for 16 years after being opened in 1911—revealed the very many practical and technical difficulties that have to be overcome before fish canning can become a commercial proposition in India. In the words of Sir F. A. Nicholson† "especially great are the difficulties when canning has to be introduced *ab initio* as an industry almost untried locally in any of its branches; where can-making has not been practised except in making kerosene and coffee tins and petty bazar objects of tin plate; where the scientific principles underlying the technology of canning are absolutely unknown; where the machinery and plant both for can-making and for canning have to be ascertained, purchased abroad, set up, and their practical working learnt through failure and loss; where every member of the can-making and canning staff has to be taught from the A, B, C of canning upward; where the methods and recipes have to be ascertained or invented; where the discouragements of many failures have to be faced, their causes sought out, and their lessons learnt; where experience has to be reduced to rules and rules rigidly enforced; where the proper sorts and qualities of material (fish, oils, tin plate, solder, labels, etc.), have to be searched out, tried, rejected or accepted; where supplies of all such materials have to be organized and the difficulties of regular supply overcome; where the resultant goods have to be placed upon untried and somewhat mistrustful markets".

The above observations made over twenty years ago hold good even to day. The difficulties still are absence of regular supplies of fish, lack of good and cheap containers, the short canning season, viz., only 100 out of 365 days (the problem is how to keep the skilled staff engaged during the remainder of the year) and "mistrust" in the market.

\* See glossary.

† Page (iii), Preface—Remarks on canning—Madras Fisheries, Bulletin No. XIII—1920.

As regards supplies of fish suitable for canning although there is fishing going on all along the extensive sea-coast, fish of a uniform size and quality and in appreciable quantities is difficult to obtain, even for a specified and limited season. The large fish canneries in the world depend for their raw material either on pelagic species like the herrings, sprats, etc., or on anadromous\* types like the salmon. These are shoaling fishes and appear in certain well defined localities very regularly year after year. In India, sardine (*Clupea longiceps*) and mackerel (*Scomber microlepidotus*) appear in pelagic shoals, but their movements are very uncertain. Shoals are sometimes absent for years together in any one place. These species are also bony. A method for softening these bones has yet to be worked out.

Fish is generally very cheap at producing centres. In an earlier section "Carriers" were suggested to bring fish in ice to consuming markets. By this mode of transport, the fish would appreciate by over 100 per cent. in price and it would be impossible for a cannery to pay so much for the raw material. High cost would prevent the canning of varieties like pomfrets, seer, etc., which are caught only in small quantities at any one place and can be assembled together at a considerable cost. Moreover 40—50 per cent. of fresh fish is non-cannable and stationary cannery has to bear the heavy handling and transport charges on this waste material. For ordinary varieties, the cost of the container remains the largest single item in the operating costs. Very good quality plates with a heavy and uniform coating of tin are necessary. Such plates have largely to be imported. If the contents are acidic, viz., preparations with tomato sauce, etc., or if prawns have to be packed, the inside of the tins have also to be lacquered. The manufacturing cost of a tin of sardine or mackerel in groundnut oil comes to 4 annas of which the cost of fish is 14 to 15 per cent., the cost of labour, overhead charges and other materials about 35 per cent. and the cost of the tin can alone 50 per cent. Finally, there is the problem of getting work for the skilled staff during the off-season.

To overcome the main difficulty, viz., regular supply of fish in prime condition and at cheap rates, a mobile cannery is suggested. A large wooden boat with all the necessary canning equipment fitted on board would serve the purpose. It could move to places where fish are shoaling or are otherwise available in large quantities. It could buy from the fishermen direct such quantities as it could handle when the rigor\* was still on the fish. It could select the proper sizes. In the Arabian Sea the fishing season commences soon after the South West Monsoon. In a calm sea and with the westerly winds blowing, such a craft can cruise along the coast and develop a reasonable speed with sails. As a matter of fact, large wooden boats are already used in India in the coastal trade and in Bengal most of the river traffic is handled by such boats. Floating canneries are being successfully† employed by the Japanese to can crabs in the Pacific and a similar venture may prove quite practicable in India.

A fast power-propelled launch should work in conjunction with the canning boat. It should replenish provisions, fuel and the empty cans and take back to a depot on land, filled cans for labelling, observations and marketing. The performance of the motor boats used by the Bombay Government as fish carriers are on record and these show that such boats can cover 270—300 nautical miles, to and fro, in 3 to 5 days. The depot for storing the canned fish and sending the requirements of the cannery can be at Karachi, Bombay, Cochin and Kidderpore (Calcutta). Empty cans can be purchased at these places and other supplies such as fuel, etc., can also be easily procured. The canned fish can then be put into urban markets without any further cost.

The capital cost including the cost of the motor boat, machinery to handle 2 tons of fish a day, the motor launch, the maintenance of the depot on the shore, working capital, etc., should not exceed Rs. 2½ lakhs. For stimulating, instructing and aiding private enterprise, the local governments should maintain experts who should also investigate the technical problems connected with the industry. Recipes which would appeal to Indian taste, should be worked out and the possibility of canning crabs, oysters and prawns in addition to fish, and the manufacture of fish pastes should also be investigated. Goods which conform to well-known standards should be certified. In foreign countries canned marine products are graded and Indian goods should also be graded according to certain defined standards.

### (3) CURING.

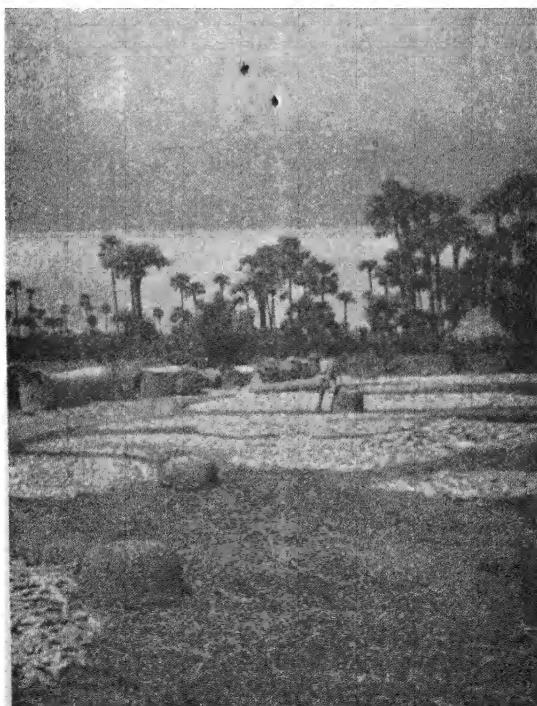
**General.**—The chief methods of curing fish in India are sun-drying without salt, salt-curing by the dry process and salt-curing by the wet process. The object of curing is to withdraw the natural moisture from the tissue cells of the fish to prevent bacterial action as well as enzymic decomposition which act rapidly in the presence of moisture and warmth. About 75 to 80 per cent. of the weight of raw fish is water. To obtain a wholesome cure the drying process should be rapid and thorough. This can be achieved by (a) heat, (b) dry air, (c) salt and (d) salt and pressure. In cases (a) and (b), moisture alone is removed from cells by hot or dry air; in case (c) salt, by the process of osmosis, displaces the fluid contents of the cells including not merely water but also the nutritive constituents present in the crystalloidal\* condition within the cells. Pressure acts by driving out the contents from the cells together with what has already been extracted from the cells by salt.

\* See glossary.

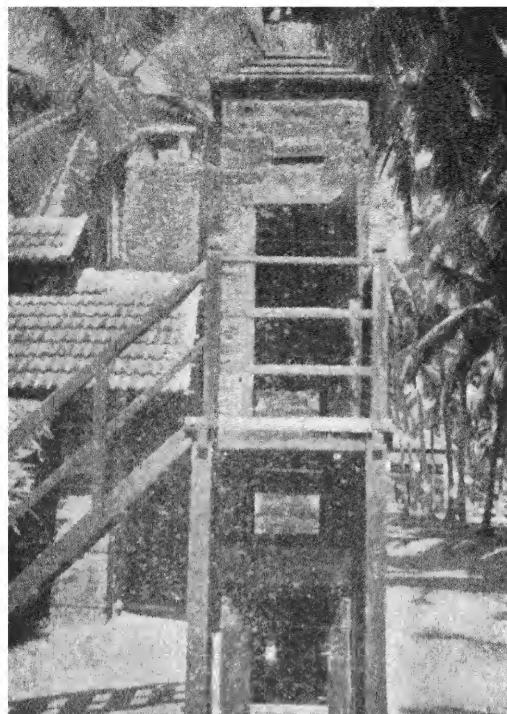
† In 1934, nine vessels were operating—Japan Year Book, 1936.



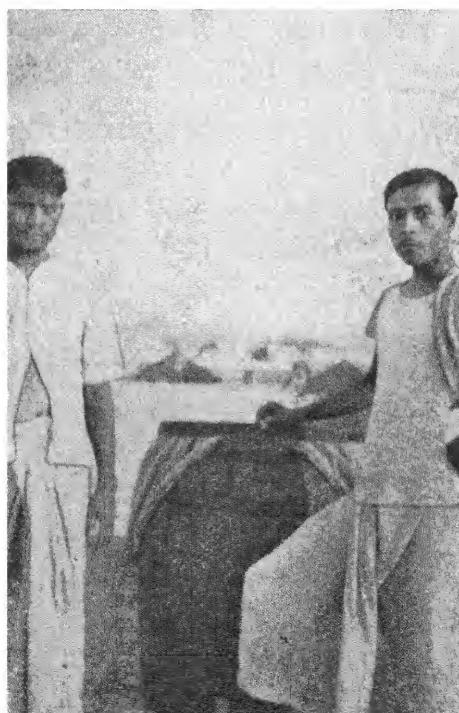
**RAISED PLATFORMS AND LOOSELY WOVEN BAMBOO *thatties*  
FOR UNIFORM DRYING OF FISH—Govt. Fisheries Station, Tanur.**



**DRYING SALTED FISH ON BARE GROUND.**



SMOKE HOUSE—Govt. Fisheries Station, Tanur.



AN IMPROVISED SMOKE HOUSE.

Drying is preferred to wet-salting by the fishermen in India. As salt is expensive, wet-salting is rarely practised. When salt is used, it is applied only sparingly, putrefaction being prevented by the subsequent heavy drying. In general, the methods of curing by the dry and wet processes yield an article which is not perhaps unwholesome, but the product is not attractive or appetising. The principles underlying the methods are fundamentally correct but the products are unsatisfactory through carelessness in applying them.

In actual practice the type of cure depends upon the kind of fish to be cured, climate, materials available for curing, the length of time for which the fish are to be kept and above all on the requirements of the intended market.

The table below indicates approximately the quantity of fresh fish cured by various methods in India. These figures are only approximate as separate statistics are not maintained regarding quantities dry and wet-salted in the Govt. fish-curing yards and as regards curing outside the yards only rough estimates are possible.

*Statement showing the amount of fish cured in India,  
(In thousand maunds.)*

Province/State.	Government fish-curing yards.			Outside fish-curing yards.			Grand Total.
	Wet-salted.	Dry-salted.	Total.	Sun-dried.	Salted.	Total.	
Sind . . . . .	9	44	53	22	<i>Neg.</i>	22	75
Bombay . . . . .	101	210	311	453	24	477	788
Madras . . . . .	120	1,200	1,320	1,600	85	1,684	3,014
Travancore . . . . .	<i>Neg.</i>	68	68	410	1,274	1,684	1,752
Cochin . . . . .	7	27	34	167	9	176	210
Orissa . . . . .	2	19	21	95	3	98	119
Bengal*	..	..	..	850	150	1,000	1,000
Baluchistan . . . . .	..	..	..	15	20	35	35
Kathiawar . . . . .	..	..	..	20	1	21	21
Total . . . . .	239	1,568	1,807	3,641	1,588	5,207	7,014
Percentage to total sea-fish caught . . . . .	2.1	13.4	15.5	31.2	13.4	44.6	60.1
Assam . . . . .	..	..	..	50	15	65	65
Other areas . . . . .	..	..	..	21	3	24	24
Total . . . . .	..	..	..	71	18	89	89
Percentage to total catch of freshwater fish . . . . .	..	..	..	1.1	0.3	1.4	1.4
Grand Total . . . . .	239	1,568	1,807	3,712	1,584	5,206	7,103
Percentage to total fish production . . . . .	1.3	8.8	10.1	20.7	8.8	29.5	39.6

\*Estuarine and sea fish.

(a) *Sun-drying*.—Drying in the sun or in the shade is the simplest method of curing fish and theoretically also the best, because the nutriments are not withdrawn from the cells and wasted as in salting. But a good cure is impossible on the tropical sea-coasts because the air, though hot, is very moist and the exterior of a thick tissue is toasted into a hardened surface when exposed to the sun, the inside remaining still moist and warm. In dry regions like the interior of Bengal and Assam, sun-drying is relatively more successful especially when the operations are carried on in winter.

Small or thin fishes such as Bombay duck, ribbon fish, prawns, silver-bellies, white bait, etc., are dried in the sun all along the coasts, chiefly where curing yards are not easily accessible or when the fish caught are very much in excess. The catch is simply spread on the beach in a thin layer on a coir mat, cadjan leaves or bamboo *thatties* to prevent admixture with sand, and dried for a day or two. Periodically the fish are turned over and before night-fall removed and heaped up in a closed enclosure. Sun-dried fish always contain 5 to 6 per cent. sand as impurity. In the absence of sun-shine, the fish especially the oily varieties putrefy and may have to be disposed of as manure. A few special products like shark fins, fish maws and trepang (*beche-de-mer*) as well as prawns, shrimp and white bait are always dried without salt. On the Gujarat coast and in Kathiawar all varieties except Jew fishes are sun-dried. In Bengal the sea and estuarine fishes are cured by simple sun-drying on the fore-shore of the Bay of Bengal in the Khulna, Bakarganj and Chittagong districts. In Assam, "Sutki" the common sun-dried fish is prepared mainly from freshwater carps such as *labeos*, *catla*, etc. After gutting, the fish are laid flat side by side on mats made of *mal-reeds* and exposed to the sun. Sometimes there are bamboo platforms 3-4 feet high to spread the fish on. The drying process is continuous and extends for a week or 10 days depending on the sunshine and the fish are not removed at night.

In other provinces, the fishermen are reported to dry small quantities of fish which they are unable to sell or consume themselves. The quantities so produced are, however, quite negligible. It will be observed from the preceding table that this method of curing is extensively used and as much as 31.2 per cent. of the total catch of sea fish is treated in this manner. On the other hand only 1 per cent. of the annual freshwater catch is cured in this manner.

(b) *Curing with salt*.—There are two methods in vogue commonly known as (a) the Common Cure or Dry Cure, and (b) the Ratnagiri or the Wet Cure. In addition, small varieties which are intended for quick consumption are sometimes "light-cured" in certain coastal areas. This process consists in lightly salting the gutted and cleaned fish by keeping them for a few hours in saturated brine and completing the cure by washing and drying in the sun.

(i) *Common cure or the dry cure*.—Large fish as seer, pomfrets, cat fish, Jew fish, perches, etc., are split through the dorsal spine from the root of the tail to the tip of the snout and the guts and gills are removed. In this position, the vertebral column remains attached to one side of the fish. The vertebral column is next severed from the fleshy side for the greater part of the depth of the fish but is not cut and removed. This operation gives the fish a wide flat shape. Scores are then made on the thick fleshy parts by passing the knife lengthwise. After washing, the fish are ready for the application of salt. In the case of thinner fish such as ribbon fish, mackerels, small pomfrets, etc., only the first dorsal cut is made. Mackerels are sometimes slit in the abdomen. Sardines are cured either by cutting off the head and the abdomen with a single diagonal cut or by simply slitting and removing the guts and gills. Large sharks are cut into pieces of convenient size and filleted.\* All cut-up fish are usually washed in sea water before salting.

The proportion of salt used varies in the different provinces. In Sind and Bombay, it is one part of salt to every five parts of fish irrespective of the variety or the season of the year. In the Madras yards, fishes are divided into five groups for purposes of issuing salt. The proportion of salt is fixed with regard to the thickness of flesh of the fish and weather conditions. Large fishes get 1: 8 in wet weather and 1: 4 in dry weather, while smaller varieties are given only 1: 8 or 1: 10. The higher proportion allowed during the wet weather is to enable more thorough expression of moisture through application of more salt to compensate for unsatisfactory drying. In Cochin, the proportion is invariably 1: 8. In Travancore the officers in charge of fish curing yards are given discretion to classify fishes into "Fat" and "Lean" varieties, the proportion being 1: 3 for the former and 1: 4 for the latter.

The salt used is marine salt obtained by the solar evaporation process. It consists of coarse small crystals with the colour ranging from brownish white to white and containing about 90 per cent. sodium chloride, 4.0 per cent. magnesium salts, 1.0 per cent calcium salts and 2.0 per cent. of insoluble matter.

The salt is applied to the scores and rubbed all over the cut surface. The fish are then arranged in layers in salting receptacles such as half-barrels, tubs, small dug-out canoes or cemented tanks. Old canoes are very popular in the Sind and Bombay Provinces. On the East Coast of the Madras Province, salting is done in earthen pots in Northern Circars, and in pits, *chatties* (mud pots) or hollowed palmyra butts in the Tamil districts. Generally, the fish are kept in salt for 12 to 18 hours. They are then taken out, washed in the "self-brine"\*\* found in the salting vessels and put out in the sun on coir mats or cadjan leaves spread on the sand. A second washing in sea water after salting improves the appearance and colour of the fish, but as the washed fish would weigh less after cure, this is rarely done. It takes at least two days to dry the fish. Nearly 16 lakh maunds of sea fish, which is 13.4 per cent. of the total annual sea fish catch, is cured in this manner. Madras Province alone dry-salts 2 lakh maunds of fish every year.

Small fish dry better than larger varieties. The fish also absorb salt during the curing process, hence it is difficult to calculate the real dryage, i.e., the net loss in weight. In the Madras yards, the average percentage is 40. Roughly it can be stated that large fish lose about one-third and small fish one-half of their dressed weight by dryage. Cured fish from fish curing yards are further dried for a day or two before despatch. If intended for long storage, the fish are periodically exposed to the sun by curers or merchants.

(ii) *Wet-salting or the "Ratnagiri" method of curing*.—As the name indicates, this is the cure generally adopted in the Konkan districts of Bombay Province. Large fish such as seer, black pomfrets, sharks, Indian salmon, etc., are generally treated in this manner. The fish are split, gutted and cleaned as for dry-salting. One pound of salt is required for every three pounds of fish; half the quantity of salt is rubbed on the cut surface of the fish on the first day which are then stacked on the floor of the curing shed to a height of 3 to 4 feet. On the second day, half the remaining salt is rubbed in and the fish so re-stacked that the top fish become the bottom ones; on the third day the remaining salt is applied and the fish re-stacked again. They are allowed to remain in this condition for another eight days and then removed; they are not sun-dried afterwards. The foul brine flowing from the stacks is absorbed by the sand on the floor of the shed. Curers from Goa, Ratnagiri, Visliadurg and other places in the Bombay Province resort to certain Madras

\*See glossary.

yards situated in South Canara to cure fish by this method. In Sind, a small amount of wet-salting is practised in the fish curing yards near Karachi. Fishermen who go out in the so-called " Ratnagiri boats" and stay out for periods upto a week in the sea, always cure their catch in this manner.

The finished product is very moist and yields to the light pressure of a finger. Fish cured in this manner should be consumed before the rains set in and in any case should not be kept for more than 3 to 4 months. Wet-salted fish normally contain 60 per cent. of water, 16 per cent. salt and 24 per cent. solid matter, against 80 per cent. water and 20 per cent. solid matter in raw fish.

(c) *Smoking*.—Smoking is almost as universal as salt curing in every country except India. The exception is probably due to the comparatively small need for a fire (for warming) in the coastal areas in this country. The preserving power of smoking is due partly to the desiccation by heat, and partly to the antiseptic action of small amounts of creosote, acetic acid, etc., present in the smoke.

The process consists in first placing the cleaned fish for a short time in brine or salt and suspending them on rods in a kiln in which a smoky fire of wood, saw-dust, rice-husk, etc., is burning. Smoking may be cool or hot, heavy or light, long or short according to the type of product desired. Light hot smoking for a short period is given when the article is intended for quick consumption.

The process is simple and often the most delicious and tasty article is the one prepared on a domestic scale by the fishermen and their families. A barrel or a packing case open at the top with a small opening at the bottom for the fire, and with a removable cover and a few spits (rods) on which the fish hang, makes a very good "hot smoking" kiln for small quantities; by placing the fire outside and passing in the smoke by a pipe, the same kiln serves for "cool-smoking". For large quantities, any cheap structure through which smoke can freely ascend serves the purpose (see plates facing page 33). Hence smoked cure can be conveniently introduced in India if only the public would accept this wholesome preserved food. At most fishing sites quantities of fish often come too late at night for Government fish curing yards or in too large quantities for ordinary handling. Instead of throwing them away as tainted or drying them for fertilizers, they might be turned into palatable food by light smoking. For this process, salting is just a preliminary to smoking and as only a small quantity of salt is needed, duty-paid salt can be used for this purpose. The fish are safe as soon as they get into the smoke. The process can be carried on even under adverse weather conditions. Experiments conducted in Madras have shown that sardine, mackerel and small seer, pomfrets, Jew fishes, ribbon fish, etc., give excellent results. Hiles will probably give the best smoked fish which may well stand comparison with the bloaters, red herrings, kippers, etc., of England and the bonito of Japan. To raise smoke, paddy husk, chips and saw-dust from teak, white cedar, coir husk, etc., can be used and can be obtained cheaply everywhere. Smoked fish will readily appeal to European taste, and the fact that there are troops stationed in several cantonments all over India, opens up the possibility of a large and immediate market for such fish.

(d) *Other methods*.—(i) *Pickling with salt and tamarind*.—Mostly mackerels are cured in this manner and the entire quantity produced is exported to Colombo. After gutting and washing, salt with a small piece of Malabar tamarind (called *Goruka pulli* in Malsbar) is thrust into the abdomen of the fish. They are afterwards arranged in layers in a barrel with a sprinkling of salt and tamarind between the layers. Heavy weights are placed on the top of the pile and the barrel is temporarily closed. At the end of 3 to 4 days the "self-brine" is run off through a small hole made in the bottom. The fish are found to have shrunk considerably. They are pressed down and the barrel is filled with more fish from other barrels to make good the shrinkage. When completely filled in this manner, the cover is put back into the barrel and the original pickle (brine) returned till the barrel is "bung-full". The proportion of salt is 30 lb. per maund of fish. Each barrel may contain 6,000 mackerels and weigh about half a ton. This type of cure is conducted only in a few yards on the west coast of the Madras Province.

(ii) *Prawn-curing*.—Prawns are cured by boiling and then drying or by simple sun-drying. The former method is resorted to chiefly during the wet weather. The crustaceans are boiled with water in wide mouthed copper vessels till they become reddish brown. After drying in the sun, the shells are removed by putting them in jute sacks and beating the sacks hard against a block of wood. The kernels are sorted out and once again dried before storage. The shells are in demand as manure. In the second process fresh prawns are simply sun-dried and the shells are not removed from the dry product. Shelling and drying result in a loss of 80 per cent. of the weight of raw prawns, while sun drying (unshelled) causes a net loss of only 40 to 50 per cent.

In Orissa, prawns are preserved by spreading them on shatties over a quick but smoky fire.

A new process for curing and storing prawns is being popularised by the Madras Fisheries Department. Here, prawns are blanched\* by dipping in boiling water or a 6 per cent. salt solution which are then shelled and salted by immersion in saturated brine for about 20 minutes. After draining off the brine, the kernels are dried either in the open air or in a drier. The drying is only partial and is stopped when the prawns are so firm that fairly strong pressure between the thumb and the finger leaves an impression on them. This product is put into a tin which is sealed and

then charged with carbon-dioxide. "Semi-dried" prawns are said to keep for nearly a year. When immersed in water for about thirty minutes the excess salt dissolves away, the prawn absorbs water and is said to look and taste like fresh fish.

(iii) *Fish pastes*.—Tamarind fish paste is prepared in Malabar from sea fishes. The fish are cut into slices and salted. When dry the slices are treated with a pungent and spicy paste consisting of chillies, mustard, garlic, tamarind, etc., prepared in vinegar. In Jalpaiguri, powdered dry fish mixed with crushed stems of caladium (*Kachu*) is made into balls. A paste called *hidal khunda* is made by Nowgong fishermen from certain small varieties of fish. These are placed in a hole dug in the ground and kept covered for nearly a month. The mass is then dried in the sun, powdered and packed into bamboo tubes. Sometimes, a little ground pepper and some alkaline ash (called "khar" in Assam) is mixed with the paste at this stage. The Maga in Cox's Bazar (Chittagong, Bengal) prepare a fish paste called *nga-pe* out of prawns. These are pounded into a paste with 3 : 1 salt and the fluid drained off. The paste is sun-dried and again pounded. The process is repeated till the product is stiff and clay-like. In Assam a favourite fish paste called *shidal sukti* is made from dried fish. These are allowed to soak for a few hours in water and then packed closely in *matkas*, the interior of which has been well smeared with fish oil. Fish oil is sprinkled between the layers. The jar is sealed and buried in the ground for several months to allow the fish to develop the necessary "taste".

#### D.—Issue of duty-free salt for fish-curing.

Throughout the world salt is the most important curing agent for fish and other live-stock products, viz., meat, hides and skins, etc. Prior to the period when salt became an excisable commodity in this country the fishermen were in the habit of preparing the salt from sea-water—the so called salt earth—for their home consumption as well as for curing fish. Even after the imposition of this duty the collection of salt earth was permitted in the Malabar and Canara districts of the Madras Province, and in the last quarter of the 19th century the common complaint was that the salt tax had destroyed a flourishing trade in cured fish in Bombay and all along the east coast from Bengal to Cape Comorin. The report of the Committee on Fisheries in Madras (1929) contains a review of the circumstances which led to the establishment of Government salting enclosures for the purpose of supply of salt at a little above the cost price for *bona fide* curing purposes. The earliest of these enclosures were opened in 1874.

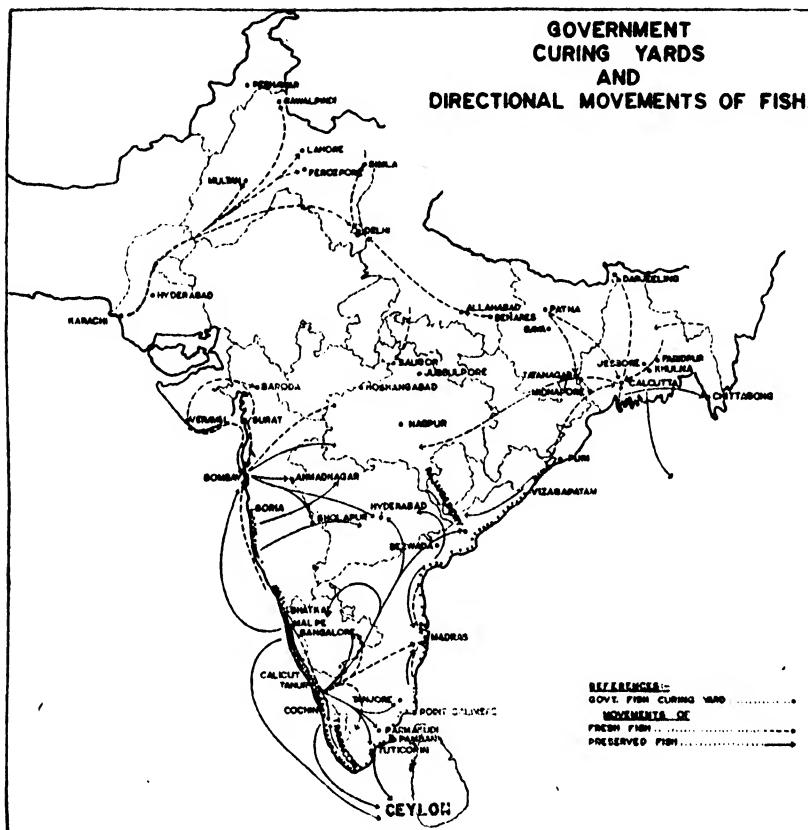
The records on the subject show that the salting enclosures (the present day 'fish curing yards') were established in the interests of the public, namely, to provide them with more wholesome salted fish as an article of diet and incidentally to save the Government the trouble, expense and risk of designing and administering measures against the use of salt earth, the collection of which was an immemorial right in certain districts. An institution like the fish curing yards does not exist in any other country.

Although the hope that the better quality cured fish manufactured in the yards would be appreciated by the public at large and would displace fish cured in the primitive way from the markets did not materialise due to the inability of the consumers—the poorer classes—to appreciate the difference between the two qualities, the fish curing yards became numerous and popular, Madras Province alone having 108 yards in 1892.

In the initial stages, the salt department of the Government of India was the administering and controlling authority. The policy of the Central Government in regard to the yards has, therefore, influenced their development to a remarkable extent. The policy adopted was to confine, as far as possible, any expense in maintaining the yards merely to foregoing the excise duty on salt issued for curing. The cost of running the yards, e.g., the construction and maintenance of salt godowns, the pay of the establishment, the cost of transport of salt from the factory to the yards, etc., was recovered by a charge made on the issue price of salt. In deciding whether or not a yard should be opened at a particular place, the primary consideration was whether the yard would result in financial gain to itself or not. There have been many instances of strong requests for opening new yards being turned down on the ground that they might result in financial loss. The Central Department supplied salt through contracts with salt merchants for delivery at particular areas. The issue price of salt, therefore, remained different in different provinces. For some reasons the administrative expenses increased both in Madras and Bombay after 1908. The amount recovered from the curers did not fully cover these expenses and the yard finances began to show deficits. At the time of transfer of the yards to the provincial fishery authorities (in 1924 in Madras and in 1934 in Bombay), with a view to avoid loss, the issue price was raised on the basis of certain financial calculations. The result was that it doubled from 10 annas to Rs. 1-4-0 in Madras and increased from 14 annas to Rs. 1-1-0 in Bombay.

For obvious reasons, a policy of opening new yards where there are reasonable chances of improving the fish business, and cheaper salt, would induce more fishermen to own "tickets" in the yards. But this is not the case even now. In Madras, for instance, applications for opening new yards are entertained only if the applicants undertake to: (a) provide a suitable site, (b) erect buildings of the size and kind required by the Department, and (c) fence the site to the satisfaction of the authorities, at their own cost. Secondly, after the issue price of salt was raised to Rs. 1-4-0, the Provincial Government is making a "profit" by operating a concession originally granted by the Government of India in the interests of public health.





In Madras Province the cost of production of salt varies from 4 annas per maund at Tuticorin to 7 annas per maund at Bimlipatam. The average cost of salt per maund for delivery at the yards in the Bombay Province (inclusive of transport charges) is 6 annas. Thus it would appear that 62.5 to 80 per cent. of the cost paid by the Madras curers are utilized towards maintenance of the yard and transport charges while in Bombay 66 per cent. is utilized for maintenance charges.

These yards were originally established more in the interests of public health than to benefit curers. No doubt, they have resulted in the quality of the cured fish being improved and a more wholesome product is now available to the poorer class of consumers. Also, the yards have rendered unnecessary the setting up of a preventive establishment for administrative measures against the use of salt earth. But as far as the fishermen are concerned they have not been benefited by the policies pursued by the Central and, later, Local Governments. The Madras Committee on Fisheries actually recommended that out of the calculated issue price of Rs. 1.4-0 per maund (including cost of salt and of running the yards) only 60 per cent. or 12 annas should be recovered from the curers, the balance being met from general revenues, but this recommendation has not been implemented yet by the Local Government.

#### E.—Note on number, location and size of fish-curing yards.

There are in all about 151 fish curing yards in India. Their distribution in the maritime provinces and States is indicated in the map facing this page. The yards deal only in salt cured fish. Each yard is a strongly fenced enclosure, from half an acre to five acres in area, depending on the quantity of fish caught in the locality. There is only one entrance and the passage to the yard is through a building which has an office room on one side and a salt godown on the other. None can enter or leave the yard without being observed by the person on duty. Larger yards are in charge of Sub-Inspectors who are paid Rs. 60—80 per month and the smaller ones in charge of Petty Yard Officers who are paid Rs. 20.

Each yard has a number of curers to whom "tickets" are issued free of cost. The majority of the ticket holders are fishermen. The number of tickets ranges from 5 to 120. All salting operations should be done within the yard, and the ticket-holder has to provide himself with a shed, salting receptacles, mats, etc., for drying the fish. The curing sheds are generally constructed in rows alongside the fence, with doors facing the quadrangle, the open space in the middle being used for drying the fish. The provincial fishery authorities who now control the yards insist that the sheds should be of a standard pattern, and with cemented tanks having rounded sides and bottom for salting the fish.

The fish brought to the yard are weighed first. When too many fish have to be handled, they are measured in baskets of known capacity and the weight calculated therefrom. Salt is then issued for curing. As already stated, the amount of salt to be applied per maund of fish depends upon the size and type of fish, the season (dry or wet weather), and the kind of cure. In the Madras yards the quantities to be issued have been carefully standardised with special reference to the above factors. Salt has to be paid for on the spot; no credit is allowed.

When the curing is over, the salted fish are weighed before they are removed from the yards. The percentage loss in weight that fish undergo during dry and wet-salting has been worked out in each yard, and the yard officer can thus satisfy himself that salt has been used in the approved manner for the approved purpose.

In Sind and Bombay Provinces, duty-free salt is issued to large boats proceeding to the sea. These boats stay out for a week or 10 days before returning to the shore and the salt is used for curing fish in the boats. The owner of the boat has to get a permit from the Collector of Salt Revenue. Thereafter he gets his name registered in the nearest fish-curing yards and makes a deposit against the cost of salt that is to be issued to him. Immediately he returns from a voyage, he has to produce for the inspection of the yard officer the cured fish and return any salt left unused. The number of large boats which go out for fishing in this manner is small. In Bombay, only 41 boats are registered to carry duty-free salt and the average quantity issued per boat is only 23 maunds per annum.

In the Bombay Province the 32 yards serve a coastline of 170 miles from Boria to Bhatkal, which is equivalent to a fish curing yard to every 5.3 miles of coast-line. No fish curing yards exist in the Bombay Province north of Boria. Of the 105 fish curing yards in the Madras Province, 56 are situated in the two districts of South Canara and Malabar, the coast-line of which is 240 miles and 49 on the east coast. In the Cochin State there are three yards (one newly opened) which serve a coast-line of 41 miles. Of the 12 yards in Travancore, 7 are located in Southern, 3 in Central and the remaining 2 in Northern Travancore. In the Orissa Province, there are only three yards and all these are in the southernmost maritime district, viz., Ganjam.

The quantity of fish cured varies according to the fishing season. In the following table the average quantity of fish brought per yard and the average quantity of salt issued during 1936-37 are given. It will be observed that fish curing is relatively more important on the Malabar coast.

Table showing the distribution of the fish curing yards and the average quantities of fish salted in them.

Name of district or section.	No. of yards.	Length of coast-line.	Average quantity of fish brought for curing.	Average quantity of salt issued.
<i>West Coast.</i>				
1. Ratnagiri district . . .	19	90	Mds. 6,974	Mds. 1,979
2. North Canara district . . .	14	80	7,395	1,989
3. South Canara district . . .	22	150	6,585	3,635
4. Malabar district . . .	34	90	17,787	
5. Cochin State . . .	2	41	15,954	1,700
6. Travancore . . .	12	172	5,635	1,486
<i>East Coast.</i>				
Madras—				
7. Southern Section . . .	14		4,159	872
8. Central Section . . .	9		10,029	1,499
9. Northern Section . . .	28	1,150	3,664	498

The transfer of the yards to the local fishery authorities has materially improved the quality of cured fish. In Madras, model curing sheds have been constructed by Government in a few yards to convince the fishermen, by actual demonstration, the value of improved sheds. In Bombay also, Government have constructed similar but larger sheds.

These fish-curing yards are unique institutions. They automatically become the assembling centres for fresh as well as cured fish.

#### F.—Note on the manufacture of fish oils.

Oils derived from fish can be classified broadly into two groups. In some fish, such as sardine, mackerel, cat-fishes, etc., oil is distributed generally throughout the muscles and the flesh, in others which have lean flesh, viz., sharks, etc., the oil is concentrated in the liver. Oils obtained from the first of these classes, by expression from the whole fish, are generally known as "fish" oils, and are used in various industrial processes such as soap-making and leather manufacture. The other class of fish yield the more valuable medicinal "liver" oils, the therapeutic value of which depends on the presence of vitamins A and D in them.

"Fish" oil and *guano*—the product obtained by drying the cooked fish after oil has been expressed—are made only on the west coast of the Madras Province (Malabar and Canara) where shoals of oil sardines appear, usually in great abundance, from August to June. In the Bombay Province and in Bengal, Assam, etc., very small quantities of crude oil are made from sharks, rays, cat-fishes, etc. But as these varieties are in demand as food, the quantities produced are negligible and the oil is used by the fishermen themselves for their domestic requirements.

From time immemorial, oil sardines have been used either for oil or for fertilizer, but in the crudest possible way. The usual method was to obtain the oil by putrefaction of a mass of sardines contained in a worn-out and filthy dug-out canoe. It was also a wasteful process, as the residue was thrown into the sea. The oil was of the worst description and odour and was useful only for smearing the planks of country boats so as to make them impervious to water. When fertilizer was desired the procedure was to spread the sardines on the sand of the open beach and dry them in the sun. Large quantities of valuable oil—of no manurial value—were wasted in the process and the product became highly impregnated with sand.

In 1907-08, the Madras Fisheries Department took up this important subject and after carrying out some experiments, recommended adoption of the American practice with necessary modifications. Under the new method, the fish were boiled in open pans over a fire and the boiled stuff was then pressed for oil. The pressed scrap was dried in the sun and formed "guano". The whole of the oil was thus obtained as a very valuable marketable product while the pressed scrap was readily assimilable as manure.

The Department also advocated the opening of small factories for the purpose. The move was attended with immediate success and several "Oil and Guano" factories came into existence. These factories are situated within 100 yards from the sea and are equipped with iron cauldrons, presses, cemented tanks, drying yards, etc., for the proper treatment of the fish and drying of the cooked scrap. To set up and work a factory for the manufacture of fish oil or guano, a licence has to be obtained from the Local Board Authorities. Such licences are granted only when they are constructed at some distance from inhabited areas and are properly equipped and ventilated.

Fish meal used for feeding cattle and poultry is also manufactured in a similar manner. The operations are conducted with greater care and the cooked fish is dried on a tiled barbecue to prevent any admixture with sand. The fish scrap is then powdered and sieved and the resultant product is "fish meal". Fish meal can be manufactured from all common fishes, but very hard bones or excessive oil in the fish are undesirable.

*Medicinal fish liver oil.*—The use of shark-liver oil as a tonic for wasting diseases was known in India as early as 1850. The method of preparation described by F. Day in his "Sea Fish and Fisheries of India" (1873) shows that all necessary precautions were taken to obtain a really high class product. A summary of this will be of great interest at the present moment:

"Livers were graded. Three grades were recognised: (1) firm and pinkish (best), (2) firm, greyish externally and reddish when cut (medium quality) and (3) flabby, whitish externally as well as internally (inferior). The liver should be treated within 6 hours of the death of fish and the gall-bladder should be at once removed and the gland thoroughly washed. The glands are next bled by slitting the veins and washing repeatedly with water. Thereafter they are cut into pieces of 4 lb. weight each. Two such are placed in an earthen vessel capable of holding from 4—5 gallons. Sufficient water is poured to cover the liver with  $1\frac{1}{2}$  inches of fluid. The vessel is placed for 15—20 minutes over a slow fire and at 130°F. it is stirred up. When frothing commences, the vessel is at once removed and placed on sand to cool. The oil floating on the top is skimmed into large glazed earthenware jars by means of a wooden ladle. The crude oil is passed through flannel, what did not pass through being rejected."

The main centre of production was Calicut, where manufacture was initiated in 1854, and during certain years over 5,000 lb. per annum were produced. About the year 1870, however, cod-liver oil began to be imported into India at a price lower than Indian fish liver oils, and the Indian industry began to languish.

The stoppage of imports of cod-liver oil due to the present War and the necessity for a cheap oil containing vitamin A has led to the revival of this indigenous industry. Medicinal oil from sharks and saw-fishes is being produced once more in Calicut. The Governments of Bombay and Travancore are also encouraging the industry. An analysis of the Indian fish liver oil has shown that, on an average, it contains 10,000 I. U. of vitamin A per gram, i.e., 10—15 times as much as the average imported cod-liver oil. Hence, before putting the oil in the market, it is blended with refined groundnut oil in suitable proportion to bring down the vitamin A potency to about 1,500 I. U. which is double that enjoined in the British Pharmacopoeia for medicinal cod-liver oil.

All along the coast, fishermen are encouraged to catch more sharks. In the Madras Province, the livers are brought by the fishermen to the nearest fish-curing yards, where they are cleaned, washed and boiled in open tin-coated copper pans, with water. The fishermen are paid at the rate of 3 annas per lb. for the raw liver. The crude oil extracted is sent to the Government Oil Factory at Calicut (newly opened), where it is purified and blended with refined groundnut oil. Vitamin A potency of the high potency oil as well as that of the blended oil are constantly tested. Sixty fish-curing yards on the east and west coasts have been provided with equipment for extraction of the oil and the yard officers have been given the necessary training. During 1940-41, 4,460 gallons of raw oil were prepared in the yards. In Bombay, the production of liver oil is more sporadic. The livers are boiled by the fishermen and the Oil Chemist attached to the Department of Industries tests such samples as are sent to him for vitamin A. This service is free and a certificate is given to the fisherman. The raw oil is understood to find ready sale in the Bombay market and the chemists who buy the oil do the necessary blending and marketing. A similar arrangement exists in Travancore.

The industry has a great future and must be put on a firm footing at once in order that it might survive outside competition when the War is over. It may be noted in this connection that the blending with groundnut oil which has an acrid flavour makes the mixture rather unpalatable. Experiments should, therefore, be conducted to discover other diluents. "Concentrates" should also be prepared and put on the market.

#### G.—Note on the manufacture of shark fins and isinglass (fish-maws).

(a) *Shark fins.*—The fins of large sharks (excepting the caudal) are cut near their roots, washed in sea water, dusted with a mixture of hot woodashes and slaked lime and dried in the sun or smoked according to the prevailing weather conditions. The cured product, which is crisp and brittle, is exported to China and other countries in the Far East. The soup prepared from the cartilaginous rays in the fins is considered to be a delicacy by the Chinese and in the Philippines.

(b) *Izinglass (fish-maws).*—Izinglass is obtained from the air-bladder (termed "sounds", "maws") of several species of sea, estuary, and freshwater fishes. The term was originally applied to the stuff obtained from the sounds of the Russian fish sturgeon.

In India the best air vessels are those obtained from perches and the Indian salmon. An inferior quality is obtained from jew-fishes and certain varieties of cat-fishes. In Sind, Bombay, the east coast of Madras and in the Sunderbans fishes of the first group predominate, while south of Bombay and all along the west coast of Madras cat-fishes are abundant. The superior quality isinglass is tongue-shaped, whereas those from cat-fishes are rounded bags with an open mouth. After they have been removed from the fish the air-bladders are slit open, washed in sea-water and sun-dried. They are then exported. Unfortunately no effort has yet been made to refine the product for the export markets.

Isinglass is used in the clarification of wine and beer. It is also used as a substitute for gelatine in confectionery, for the preparation of special cements and as a constituent for special water-proofing composition.

#### H.—Suggestions for improvement in the preparation of fish for the market.

##### (1) A REVIEW OF EFFORTS MADE IN OTHER COUNTRIES.

Organized efforts are being made in other countries to make improvements in the design and equipment of fishing vessels, in the catching and releasing power of various nets, and in the transport, storage and treatment of fish after they have been caught. In Great Britain, the Advisory Committee on Fishery Research (Ministry of Agriculture and Fisheries), the Scottish Fishery Board and the Department of Scientific and Industrial Research as well as the powerful British Trawlers' Association constantly experiment on new methods of catching and utilizing fish. The Bureau of Fisheries, Washington, the Biological Board of Canada, the Fisheries Section of the Council for Scientific and Industrial Research (Commonwealth of Australia), the Fishery Department in the Union Government of South Africa and the "Suisankai" of Japan also make similar experiments and researches.

##### (2) THE OUTLOOK FOR INDIA.

India, however, cannot boast of any such comprehensive organisation of her own. This is partly due to the manner in which the fishing industry is carried on in this country. Firstly, the industry is scattered and the boats in which fishermen ply their trade are small and their nets are of low catching power. Secondly both fishermen and fish curers are illiterate and backward and belong to a class of persons who are extremely slow in adopting improved methods. Thirdly, curing methods are crude and poor. Even such simple things as the gutting and cleaning of fish in the boats and immediate application of salt or ice to check decomposition are seldom practised. In the circumstances, it appears that reforms, if any, can be attempted only in the larger fishing centres adjoining urban markets in the coastal regions.

The following improvements can be effected without much expenditure of time or money:—

(i) *Collecting*.—Fish should be killed as quickly as possible after catch. Exhausted fish putrefy more rapidly than fish stunned to death. Fish should be properly stowed in boats so that they are not trodden upon, or needlessly exposed to the sun. To expedite the collection of fish from fishing boats, the use of power-propelled vessels as fish carriers should be encouraged.

(ii) *Cleanliness*.—In a tropical country like India, cleanliness is of vital importance. Unfortunately, however, this is singularly absent in the boats, baskets, curing tubs, etc., which are used by fishermen in this country. The sheds lack proper ventilation and the curing yards are littered with decomposed guts of cleaned fish. To bring about some appreciable improvement, it would be necessary to adopt, on a larger scale, the Bombay Government's plan to construct model curing sheds at Government expense and recover the outlay by levying a cess on salt sold in the yards.

(iii) *Necessity for rapid transfer of fish to the market or curing yards*.—The necessity for taking fish as quickly as possible to the market is obvious.

(iv) *Sun-dried fish*.—Only thin varieties should be sun-dried. They should be spread on loosely woven bamboo trellis-work which should be supported on raised platforms. This would ensure simultaneous drying of both surfaces and will prevent admixture with sand. (See plates facing page 32.)

(v) *Salt-cured fish*.—The defects generally noticed are:—(a) the amount of salt used is often insufficient; (b) the fish are left for too short a period in salt; (c) the fish are not washed in clean sea water when taken out of the curing vats; and (d) the fish are dried on the ground, sometimes without mats, so that the under side does not dry up properly.

The result is that the Indian salt-cured fish has a bad odour and does not "keep" long. All these defects enumerated above could be remedied by applying a little more time and attention to the curing.\*

(vi) *Manufacture of industrial products*.—The simple process of extracting oil from shark-liver should be taught to fishermen. Arrangements should then be made for collecting the oil and for testing, blending and marketing the same.

#### I.—Cost of preparation for the market.

In the case of fresh fish intended for local consumption, gutting is not practised in the coastal areas. Fish merchants simply remove the entrails and clean the fish which they send packed in ice. No special expenditure is, therefore, incurred.

\* Recent researches conducted in America have shown that the reddening ("Pink eye") of salt cured fish is caused by an organism which is present practically in all sea-salt and which grows on the walls and floors of the fish salting factories. Thorough disinfection of the salting plants and the use of sea-salt after it has been sterilised by heat would remedy the trouble. It is estimated that more than 40 per cent. of salted fish is rendered valueless by the development of Pink-eye.

In the case of curing, however, large quantities have to be handled and there are a number of items of cost. The items are (a) cost of transport from the beach or landing centre to the curing or processing yards, (b) cost of gutting and cleaning, (c) cost of salt and salting, and (d) cost of drying. Of these gutting charges, salting expenses and the quantity of salt used, vary according to the size of the fish and the locality where the curing is done.

The approximate cost of curing one maund of raw fish in the different provinces is given in the following table:—

Approximate cost of curing one maund of raw fish.

Name of province and type of curing.	Transport charges.		Gutting and cleaning charges.		Cost of salt.	Salting charges.	Drying or labour charges.	Total cost.	
	From	To	From	To				From	To
	A. P.	A. P.	A. P.	A. P.	A. P.	A. P.	A. P.	Rs. A. P.	Rs. A. P.
<b>Sind—</b>									
Sun-drying . . . .	0 6	2 0	0 6	3 0	..	..	4 0	0 5 0	0 9 0
Dry-salting . . . .	0 6	2 0	0 6	3 0	3 2	2 0	4 0	0 10 2	0 14 2
Wet-salting . . . .	0 6	2 0	0 6	3 0	5 4	2 0	3 0	0 10 4	0 15 4
<b>Bombay—</b>									
Sun-drying . . . .	1 0	1 6	0 6	3 0	..	..	4 0	0 5 6	0 8 6
Wet salting . . . .	1 0	1 6	1 0	3 0	6 0	2 0	4 0	0 14 0	1 0 6
<b>Madras—</b>									
Dry-salting (Tanur) . .	0 6	1 0	0 6	2 0	3 6	1 0	2 0	0 7 6	0 9 6
Pickling in barrel (Malpe) . .	0 6	1 0	0 6	2 0	15 0	4 0	8* 0	1 12 0	1 14 0
Boiling and drying prawns (Ponnani).	0 6	1 0	0 6	2 0	..	..	5† 0	0 6 0	0 8 0
Pit curing (Tuticorin) . .	0 6	1 0	0 6	2 0	7 0	3 0	3 0	0 14 0	1 0 0
<b>Bengal—</b>									
Salting Hilsa (Ambaria-Barisal)	..	..	2 0	2 6	12 0	4 6	..	1 2 6	1 3 0
Sukti (Ashuganj) . . . .	..	..	..	..	..	..	..	0 12 0	1 4 0

It may be stated that curing expenses amount to 10 and 25 per cent. respectively of the price of sun-dried and salted fish. In the latter case, the cost of salt alone comes to about 15 per cent.

The cost of treating 1 ton of fresh sardine for the extraction of oil is as given below:—

Transport to the factory—	Rs. A. P.
30 baskets at 6 pies per basket . . . . .	0 15 0
Fuel . . . . .	0 6 0
Labour charges for boiling and processing—2 coolies at 6 annas each . .	0 12 0
Labour charges for separating the oil and drying the "scrap"—3 coolies at 6 annas each . . . . .	1 2 0
Total . .	3 3 0

The cost of treating 100 lb. of shark liver yielding about 4.25 gallons of medicinal oil (Uppada) comes to 13 annas as shown below:—

Fuel . . . . .	Rs. A. P.
Cooly charges for skimming and filtering the oil . . . . .	0 4 0
	0 9 0
	0 13 0

\* Cost of barrel and tamarind included.

† Cost of fuel included.

## CHAPTER V.—DEMAND AND UTILIZATION.

Fish has been used as an article of human diet since pre-historic times. Being a rich and palatable food, it has always been held in high esteem. Recent research on dietetics has shown that fish proteins are easily and completely digested and that fish fat is usually rich in two accessory food factors, viz., vitamins A and D.

The bulk of the fish caught in this country is used as food for man. In addition to being eaten fresh, it is preserved by chilling, drying, salting, pickling and smoking. Fish which is found surplus is converted into oil, fertilizer, etc. Oils of two kinds are obtained—the "medicinal oil" from the livers of sharks and other cartilaginous fishes, and "fish oil" from certain marine or fresh water species. Fish roes are either salted or dried. Coarse isinglass is prepared from various marine and freshwater fishes and the fins of large sharks are limed and dried.

## A.—Demand.

(1) *Per capita consumption of fish and fish products.*

The estimated average *per capita* consumption of fish in respect of India as a whole is 3.4 lb. This includes the quantity consumed as fresh fish and as fish products. Actual consumption in different tracts varies widely from this all-India average figure due to (a) local concentration of fishing resources, (b) the food habits of people and (c) the prevailing price of fish (or products).

As suitable arrangements have not been adequately developed in this country to transport fish in a fresh condition to distant consuming centres, fish is available at cheap prices in all the marine and most of the freshwater fishing centres. In producing areas, therefore, the *per capita* consumption is higher.

Custom, religion and prejudice play a big part in determining the demand for fish. For instance, while in Sind both Hindus and Muslims are accustomed to eat fish, in the Punjab fish is not very popular although there is no religious taboo against it. In the North-West Frontier Province and in Baluchistan also, the Pathans prefer meat to fish. In Delhi and the upper parts of the United Provinces, Hindus and even Muslims refuse it entirely, unless they happen to be living on the banks of a large fishing river. In Bihar, lower Bengal and in Assam, on the other hand, fish is very largely consumed, whilst in Orissa, Madras, Mysore, Hyderabad and Bombay, a very great proportion of the people would eat it if they could obtain it. In the hilly districts fish is almost universally eaten when it can be procured. Taking India as a whole, Brahmins (except the Kashmiri pandits and residents of Bengal and certain portions of Bihar), certain sections of caste Hindus, e.g., Shabras, Vaishnavs, followers of Sivas, Deva Samajists, etc., Jains and Buddhists, totally reject fish as food.

In the interior of the country fresh fish (local freshwater fish or imported sea fish) is a luxury even for the middle class people and sun-dried or cured fish is not very popular with the majority of the consumers. Further, in the interior, fish has to compete with meat. Enquiries made in the course of the survey have revealed that fish costs from 1½ to 4 times that of best quality mutton. For instance, at Delhi, while meat was selling at 6 annas a seer, freshwater fish was quoted at 10 annas a seer and sea fish at Rs. 1.4-0 to Rs. 1.8-0.

The net available supply of fish and consumption in important areas are given in the table below. Although the inter-provincial or inter-State movement in fresh fish is small, there is a considerable trade between provinces and states in regard to dry and cured fish. These have been taken into account in calculating the *per capita* consumption of fish.

*Estimated per capita consumption of fish in different areas.*

	Quantity of fish available for consumption* (Thousand maunds).	Population in thousands (1941 census).		Per capita consumption.	
		Total.	Estimated number of persons who have no objection to eat fish.†	On the basis of total population.	On the basis of number of persons who eat fish.
Assam . . . . .	482.9	10,930	8,785	(lb.) 3.64	(lb.) 4.52
Baluchistan . . . . .	81.0	858	729	7.77	9.14
Bengal . . . . .	5,024.4	61,460	45,618	6.73	9.07
Bihar . . . . .	882.7	36,340	23,621	2.00	3.06

\* These figures are in terms of fresh fish. The quantity of freshwater fish caught by non-professional fishermen and consumed by themselves has not been taken into account. As the approximate equivalents in terms of fresh fish of (1) balance of exports of cured products from India and (2) estimated production of fish manure, have been excluded.

† Calculated by deducting from the total population of each tract the number of (1) Jains, (2) Buddhists, (3) 15 to 35 per cent. of the total Hindu population depending on the tracts, (4) children under 5 years of age (18 per cent.) and people aged 65 and over (3 per cent.) and (5) Hindu widows of Bengal.

Estimated per capita consumption of fish in different areas—contd.

	Quantity of fish available for consumption* (Thousand maunds).	Population in thousands (1941 census).		Per capita consumption.	
		Total.	Estimated number of persons who have no objection to eat fish.†	On the basis of total population.	On the basis of number of persons who eat fish.
Bombay . . . . .	1,736.0	20,850	13,498	6.85	10.59
Central Provinces . . . . .	165.0	18,606	12,568	0.73	1.08
Cochin . . . . .	251.8	1,205†	1,059†	17.19	19.56
Delhi . . . . .	10.0	918	650	0.90	1.27
Hyderabad . . . . .	41.6	14,436†	10,314†	0.24	0.33
Kathiawar . . . . .	71.3	4,904	3,223	1.20	2.64
Madras . . . . .	4,946.2	49,840	29,886	8.16	13.62
Mysore . . . . .	101.7	6,587†	4,710†	1.28	1.78
North-West Frontier Province . . . . .	8.7	5,416	4,603	0.13	0.16
Orissa . . . . .	565.8	13,370	10,331	3.48	4.51
Punjab . . . . .	36.6	34,310	28,535	0.09	0.11
Sind . . . . .	435.0	4,835	3,675	7.91	9.76
Travancore . . . . .	1,087.0	6,080	4,820	14.71	18.53
United Provinces . . . . .	139.9	58,346	35,928	0.20	0.32
Total India . . . . .	16,072.4	388,800	—	3.40	—

It will be observed from the above table that the per capita consumption is high in the maritime provinces and States. The highest figure, viz., 17.19 lb. (19.56)† is recorded in Cochin closely followed by Travancore with 14.71 lb. (18.53)†. Both are small States with long stretches of coastline and immense inland fishing resources. Amongst the non-maritime provinces Assam leads with a per capita of 3.64 lb. (4.52) followed by Bihar with 2 lb. (3.08). Consumption in the Punjab, viz., 0.09 lb. (0.11), is the lowest in the whole of India.

In the marine fishing areas of the west coast, particularly in the areas south of Bombay, the per capita consumption is considerably higher than the figures computed for the provinces of Bombay and Madras or for Travancore and Cochin States. For instance, the per capita consumption in the fishing villages of Konkan and Kanara districts of the Bombay Province was estimated in 1931 to be as high as 81.61 lb.†

In Madras and in Deccan besides fresh fish, large quantities of cured and sun-dried fish are also consumed. The comparatively high figure for Mysore is due to this reason.

#### (2) Per capita consumption in urban areas.

In urban areas where people are comparatively well-to-do, the demand for fish also is higher. Organized trade in fish exists mostly in the urban areas. The per capita consumption of fresh fish in some towns and cities of India is given in the following table. The figures of per capita consumption in the corresponding provinces are also given for comparison.

\* These figures are in terms of fresh fish. The quantity of freshwater fish caught by non-professional fishermen and consumed by themselves has not been taken into account. Also the approximate equivalents in terms of fresh fish of (1) balance of exports of cured products from India and (2) estimated production of fish mawne, have been excluded.

† Calculated by deducting from the total population of each tract the number of (1) Jains, (2) Buddhists, (3) 15 to 35 per cent. of the total Hindu population depending on the tracts, (4) children under 5 years of age (13 per cent.) and people aged 65 and over (2 per cent.) and (5) Hindu widows of Bengal.

‡ 1931 census.

§ Figures in brackets denote per capita consumption on the basis of number of persons who eat fish.

|| Seeley : Marine Fisheries of the Bombay Province, page 22.

Name of the centre.	Per capita.	
	Urban consumption.	Corresponding provincial consumption.
	(lb.)	(lb.)
Bombay	16.02	6.86
Calcutta	21.38	6.73
Calicut	52.10	8.16
Cuttack	13.29	3.48
Delhi	1.02	0.90
Jubbulpore	1.38	0.73
Lahore	0.69	0.09
Madras	15.89	8.16
Bangalore	38.57	8.16
Peshawar	2.64	0.13

Enquiries have shown that in every province and State there is hardly any town which does not receive some supply of fish, however small, for consumption, while there are vast tracts of rural areas where no fish is ever seen.

### (3) TREND OF FISH CONSUMPTION IN INDIA.

While discussing the trend of production of fish (page 18 of this Report), it was stated that wide fluctuations occur in the total production of sea fish from year to year and that an examination of all available data leads to the conclusion that the marine fishing industry has made very little progress in India in recent years. As regards freshwater fisheries, it was stated that the annual catch was progressively declining in quantity. The population of India, on the other hand, has increased by 15.0 per cent. during the decade ended 1941. The conclusion is, therefore, irresistible that the *per capita* consumption of fish has declined appreciably in recent years. This is also borne out by investigations made in certain selected centres in the course of this survey.

### B.—Utilization of fish in India.

#### (1) GENERAL.

Fish is utilized both for food as well as for the manufacture of products like manure, guano, fish oil, etc. Fish employed as food may be classified under two heads, *viz.*, fish used in the fresh condition and that used in the form of preserved products.

Estimates of the quantities utilized for various purposes in different areas may be seen in the Appendix XIV of which the following is a summary :—

#### *Utilization of fish in India.*

	Annual quantity. (Thousand maunds).	Percentage to total production.	Percentage to total quantity converted into products.
Consumed fresh fish	8,968.3	50.1	..
Converted into sun-dried fish	3,713.7	20.7	41.5
Converted into salted fish	3,390.4	18.9	37.8
Converted into fish manure, etc.	1,852.6	10.3	20.7
Total	17,925.0	(100.0)	(100.0)

It will be observed from the above that nearly 90 per cent. of the total production is utilized for edible purposes and only 10 per cent. for the manufacture of industrial or other products.

## (2) CONSUMPTION AS FRESH FISH.

The proportion of the total production which is consumed as fresh fish varies widely in the different areas. In the non-maritime provinces and States the supply is almost entirely from freshwater and most of the fish is consumed as fresh fish.

The different varieties are held in various degrees of estimation in different areas. Sharks and other cartilaginous fishes are popular in the southern parts of the Bombay Province and generally everywhere in Madras Province, but there is a poor demand for these varieties in Sind, Bombay city and in Bengal. Cat-fishes and eels which possess no scales are rejected by Jews and Shia Muslims. There are also local peculiarities which account for the popularity of particular varieties. For instance, hilsas caught in brackish waters in the estuaries of Bengal are better prized than those netted higher up in the Ganges. Urban consumers prefer fish with clean appearance, firm flesh with the minimum of small bones and good taste. For this reason pomfrets, seer fishes, mullets, beekti, Indian salmon, soles and prawns among marine fishes and hilsa, carps and "live" fishes among freshwater fishes are greatly in demand. Magur (*Clarias magur*), murrels (*Ophiocephalus Spp.*), climbing perch (*Anabas scandens*) and the other species which are marketed alive are considered very nourishing and are specially in demand in certain areas.

A peculiarity about Indian consumers is that those accustomed to eating freshwater fish have no liking for sea fish and similarly those accustomed to sea fish seldom go in for freshwater fish.

In India fish is cooked and eaten with rice and *chapatties*. It is also consumed after being fried in ghee along with potatoes.

## (3) PREPARATION OF SUN-DRYED FISH.

As much as 20.7 per cent. of the total production of fish is marketed in the form of sun-dried fish. Assuming that drage reduces weight to about one-third, 37.1 lakh maunds of fresh fish utilized for sun-drying yield nearly 12.4 lakh maunds of the dried product. Here also, the proportion of the total catch which is sun-dried varies considerably in different areas. Small marine fish can be satisfactorily preserved by drying and hence sun-drying is more common in the maritime provinces and States. As regards freshwater fish, sun-drying on a commercial scale is resorted to only in Assam and in certain parts of Bengal.

In the coastal areas, where fresh fish can be obtained cheap, there is practically no demand for dried fish, except during the monsoons. Of the different varieties preserved by drying, only Bombay Duck is in demand by the better class of consumers. All other varieties of sun-dried fish are consumed by the poorer classes.

## (4) PREPARATION OF SALTED FISH.

It is estimated that nearly 33.9 lakh maunds or 18.9 per cent. of the total production of fish are cured by salting in some form or other. As has already been stated in the chapter on preparation for market (page 33), 15.5 per cent. of the annual production of seafish are cured with salt in fish curing yards, of which 2.1 per cent. are wet-salted and 13.4 per cent. dry-salted. In addition 13.4 per cent. of the total production of sea fish and 0.3 per cent. of freshwater fish (mainly in Assam) are cured with salt outside the yards. The varieties in demand for the preparation of salted fish are sardines, mackerels, cat-fishes, seer fishes, pomfrets, sharks, soles, prawns, etc. For the preparation of wet-salted fish and for brine pickling for export to Ceylon, mackerels are preferred, while for making other pickles, tamarind fish, etc., seer fishes are popular. In Assam for the manufacture of "Shidal sutki", *punti* fish is used. Prawns which used to be exported to Burma were usually salted and shelled before despatch. Salted pomfrets, seer, soles and to some extent cat-fishes are consumed by the middle classes while the other varieties are almost wholly eaten by the poorer classes in the interior of the country.

It will be observed from the figures given in Appendix XIV that the proportion of the total catch salted is as high as 50 per cent. in Travancore. In Madras 28.9 per cent. is utilized in this manner, while the corresponding percentages for Bombay, Baluchistan, Sind and Cochin are 23.2, 21.5, 11.4 and 6.7 respectively.

The kind and quality of curing depends upon the demands of the market. On the west coast of India fish intended for export is better cured than that intended for internal consumption. In certain areas, the highly flavoured products of the crude curing methods are in demand, e.g., the pit cured moist salted fish known as "Madura cured fish" is in demand in the southern districts of the Madras Province, the "Ratnagiri" cured fish in the cotton tracts of the Bombay Province, the "hidal khunda" of Nowgong and "ba-lee-chong" of Chittagong in Eastern Bengal and Assam.

## (5) UTILIZATION AS MANURE.

The quantity of fish used as a fertilizer varies from year to year and depends upon the appearance of shoaling varieties in the west coast of India. The total quantity of fish utilized as manure is estimated at 18.5 lakh maunds or 10.3 per cent. of the annual production.

Fish is applied directly on fields as manure only in the coastal areas when sardines, mackerels and horse mackerels appear in enormous shoals.

More important as manure is fish which is unfit for food and is dried on the sands of the beach. The product is known as " Beach " manure. Horse mackerels, mackerels, and sardines are utilized for this purpose. The annual production is estimated to be 2.28 lakh maunds of which 9,064 maunds are produced in Sind, 110,595 maunds in Bombay, 102,750 maunds in the west coast of Madras Province and 4,800 maunds in other areas. Assuming that the dry weight is 20 per cent. of the weight of fresh fish treated, the quantity of fish utilized for the preparation of Beach manure works to 11.38 lakh maunds in a year. Beach manure contains 5 to 7 per cent. nitrogen and up to 15 per cent. sand. It is largely in demand for use as a fertilizer in coffee and tea plantations.

Fish manure, popularly called " guano ", is the dry refuse after oil has been pressed out from cooked sardines (*Clupea longiceps*) during the manufacture of sardine oil. Fairly accurate statistics of the annual production of " guano " are available only for the South Canara and Malabar districts of the Madras Province. The average annual quantity of " guano " produced during 20 years ending 1940-41 works out to 5,250 tons or 142,905 maunds. Taking the ratio of " guano " to fish as 1:5, the average quantity of sardines utilized for this purpose works out to 714,525 maunds. " Guano " disintegrates in the soil readily and is easily assimilated by plants. The low percentage of oil is an additional advantage. The best varieties contain less than 5 per cent. sand and 8 to 10 per cent. of nitrogen and phosphorus. Fish " guano " is used in the tea and coffee plantations of Mysore and Nilgiris. During the quinquennium ended 1939-40, 1.18 lakh maunds of fish manure (mostly " guano ") were annually exported from this country, mainly to Ceylon.

#### (6) MANUFACTURE OF OTHER PRODUCTS.

(a) *Fish-maws and shark fins.*—Reliable statistics showing the production of fish-maws and shark fins separately are not available. The annual production of both is estimated at 8,000 maunds of which 7,500 maunds are exported to countries in the Far East.

(b) *Canned and bottled fish.*—The industry has made no progress in India and the quantity utilized annually in canning is less than 100 maunds.

As already stated, India imports on an average 10,578 cwts. (13,750 maunds) of canned and bottled fish every year. The entire quantity is consumed by the Europeans, Anglo-Indians and middle-class Indians in the urban areas.

(c) *Fish oil.*—Sardine oil which is the only fish oil produced on a commercial scale in India is obtained as a by-product in the " guano " industry. The average recovery as oil is 5 per cent. 7.1 lakh maunds of sardines used for " guano " manufacture would, therefore, yield 35,726 maunds or 258,679 gallons of oil. The oil is consumed in industries such as soap-making, batohing jute, tanning leather, etc. Small quantities of oil produced by fishermen in most of the fishing villages by crude methods are also used for caulking boats. In Bengal and Assam, fish oil prepared from *punti* fish is also used as a crude illuminant.

The available supplies and the demand for shark-liver oil have already been discussed on page 39 of this Report.

(d) *Fish meal.*—Powdered fish " guano " when used as feed for poultry, pigs, cattle, etc., is known as fish meal. Its use, however, is not popular in this country and the quantity produced is insignificant.

#### (7) DEMAND AND UTILIZATION OF MINOR SHELL FISH.

Shell fish, e.g., crabs, clams, lobsters, oysters, turtles, etc., are caught in small quantities in most parts of the littoral area. Crabs and a river turtle called " Bungoma " are caught also from fresh-waters. Out of an estimated production of 63,000 maunds in India, nearly 70 per cent. is caught in the estuarine regions of Bengal and consists mainly of lobsters and crabs. The creeks and estuaries of the Bombay Province yield 20 per cent., most of which consist of clams. Shell fish is not produced in commercial quantities in the other areas.

Oysters are in demand only in the larger towns. In the Madras Province, oyster shells are powdered and sold by the Fisheries Department as " shell grit " for feeding poultry.

Though lobsters fetch a high price in some markets, they do not find favour in other parts of the country. Crabs are in good demand in large towns. Clams are abundant during the monsoons when fish is scarce. The green sea turtle (*Chelone mydas*) is common in the Palk Bay round the Rameswaram islands and off Tuticorin. The turtles caught are mostly " shipped " alive to Jaffna in Ceylon where there is a good demand for them. The " hawks bill " which yields the highly priced tortoise-shell is also netted occasionally in the same area: the flesh of this reptile is however inedible. The leathery turtle (naiarine) caught in Travancore and the South Madras Coast is used exclusively for the preparation of the turtle oil.

## (8) DEMAND FOR BY-PRODUCTS.

(a) *Prawn manure*.—During the manufacture of shelled prawns, prawn dust is obtained as by-product and is largely employed as manure. The total production is estimated at about 1.8 lakh maunds, part of which is exported to Ceylon.

(b) *Shell for lime-burning*.—The shells of clams, oysters and various other marine animals yield excellent lime on calcination. No estimate is available regarding the quantity produced in the country but production is believed to be quite considerable.

(c) *Pit manure*.—The fish offal, particularly the refuse obtained by gutting and cleaning fish prior to its being cured in the fish-curing yards, is put in pits and allowed to decompose. The production of this pit manure is, however, small and its use is limited to local areas owing to the difficulties of packing and transport.

## C.—Seasonal variations in demand.

(a) *Sea fish*.—Sea fish is consumed all the year round in the coastal areas. But a seasonal factor can be noticed in the demand during the different months. For instance, when prime food fishes, viz., pomfrets, seer, hilsa, etc., are available, the urban markets usually reject the bony varieties. The movements of sea and estuarine fish from producing centres on the west and east coasts, given in the table below indicate that the monthly variations in demand are somewhat different in different areas:—

	Karachi.		Ernakulam.		Chilka fish.*	
	Quantity.	Percentage.	Quantity.	Percentage.	Quantity.	Percentage.
	Mds.		Mds.		Mds.	
January . . .	2,309	10.4	607	13.1	820	7.5
February . . .	2,125	9.2	325	7.0	748	6.9
March . . .	2,125	9.2	344	7.4	949	8.7
April . . .	1,805	6.9	338	7.3	1,380	12.6
May . . .	1,538	6.7	259	5.6	1,280	11.7
June . . .	1,364	5.9	295	6.3	973	8.9
July . . .	1,208	5.2	473	10.2	785	7.2
August . . .	1,174	5.0	686	14.8	726	6.6
September . . .	1,329	5.7	526	11.3	562	5.1
October . . .	1,713	7.4	233	5.0	618	5.7
November . . .	3,278	14.2	281	6.0	1,022	9.4
December . . .	3,283	14.2	278	6.0	1,064	9.7
Total . .	23,141	(100)	4,645	(100)	10,926	(100)

\*Rambha, Kaluparaghath, Chatarpur and Gangadharpur.

It will be observed that from Karachi the largest quantities are exported during November to March, from Ernakulam during July, August and September, whilst the heaviest despatches of Chilka fish occur during April, May and June.

(b) *Freshwater fish*.—In the interior, climatic conditions determine the supply and demand. Figures are given in a table on page 18. It would be noticed that wide variations in demand occur from province to province and even from district to district in the same province.

(c) *Cured fish*.—In the absence of other data, the monthly variations in demand for preserved fish (sun-dried, wet-salted and dry-salted) can be examined with the help of the following table showing exports of cured fish from Bombay and Madras ports and from Travancore. The largest export occur from November till the end of January.

	Month.	Quantity ex-ported. (cwt.)	Percentage to annual total.
January	.	51,531	14.3
February	.	35,377	9.8
March	.	27,722	7.7
April	.	22,331	6.2
May	.	18,650	5.2
June	.	17,806	4.9
July	.	17,051	4.7
August	.	17,577	4.9
September	.	20,201	5.6
October	.	29,514	8.2
November	.	51,826	14.4
December	.	50,686	14.1
	Total	360,272	(100)

In the table below the quantities of fish cured in the government fish curing yards on the west coast of the Madras Province during the five-year period ending 1939-40 are given:—

*Production of cured fish in the South Canara and Malabar districts of the Madras Province.  
(Thousand maunds.)*

Month.	1935-36.*	1936-37.	1937-38.	1938-39.	1939-40.	Quinquen-nial average.	Percentage.
July	24.8	23.3	26.1	26.7	33.6	26.9	3.9
August	29.5	30.2	48.4	60.5	38.1	41.3	6.0
September	53.4	78.5	105.9	52.6	90.2	76.1	11.0
October	110.9	146.7	107.6	153.0	124.5	128.5	18.5
November	147.4	98.2	69.7	76.3	128.7	104.1	15.0
December	151.6	110.0	38.0	39.6	86.5	85.1	12.2
January	137.2	115.5	40.8	28.1	89.9	82.3	11.8
February	89.9	48.1	28.2	17.4	29.7	42.7	6.1
March	91.9	23.3	19.5	14.9	21.1	34.2	4.9
April	39.8	23.0	42.0	18.4	16.9	28.0	4.0
May	24.8	40.7	32.9	20.7	25.2	28.9	4.2
June	13.0	11.4	26.5	15.8	17.3	16.8	2.4
Total	914.2	748.9	585.6	524.0	701.7	694.9	(100)

\* The fisheries year in the Madras Province commences from 1st July.

The trend of production of cured fish is erratic, depending as it does upon the total catch which varies from year to year. It will be observed that curing is heavy from September till the end of January; nearly 68 per cent. of the annual total is accounted for during these months.

## CHAPTER VI.—WHOLESALE PRICES.

Reliable price records for fish are not available for any fishing area in this country. The trade in the early stages, is in the hands of illiterate fishermen who do not maintain any records. Even curers and merchants in the urban markets do not maintain satisfactory price records. A comprehensive analysis of this subject is also rendered difficult due to variations in type, quality, size, weight, etc., of fishes, all of which have a bearing on prices. Being a livestock commodity, uniformity in regard to the above factors between the catches landed in different areas is not to be expected. The method of quotation varies from place to place. In the wholesale trade, hardly any sorting is done and as such separate prices are not available on the basis of varieties or sizes, e.g., large, medium and small. The recorded figures at some municipalities are not of much use as they are generally retail prices.

Prices for sea fish in the costal areas of the Madras Province have been calculated from records of the estimated catches and values of the economic varieties, maintained by the Madras Fisheries Department. Prices in other provinces and States have been compiled with the help of information collected during this survey from fishermen and the fish trade. Regarding cured fish prices, quotations for five important markets given in the weekly bulletins of Madras Fisheries Department, constitute the only price statistics.

Under the circumstances, it has been possible to indicate, only in a general way, the seasonal variations, trends and other variations in prices in the sections that are given below.

## A.—Units of sale and basis of price quotations.

In the primary markets fish is never weighed. According to varieties the fishermen offer their catches in small lots or in heaps. The buyers, however, are reported to mentally estimate the weight of any lot before offering a price. Fish sold by auction in terminal markets are also not weighed. Sea fish in costal areas are seldom weighed in retail trade while in the interior, both sea and freshwater fish, sold on cut, are retailed on the basis of weights. Units adopted for cured fish are often different from those in use for fresh fish.

The table below shows the units of sale and basis of price quotations according to types in the chief markets in some provinces and States.

Units of sale and basis of price quotations.

Area.	Varieties.	Units of price quotation.		Equivalent in standard weights.
		Wholesale.	Retail.	
<i>1. Fresh fish.</i>				
North-West Frontier Province.	All varieties	Rupees per local maund.	Annas per local seer.	1 seer = 105 tolas. 1 maund = 40 seers.
Punjab . . .	Do. . .	Rupees per standard maund.	Annas per seer .	In some places the local maund of 16 seers is also employed.
Bombay— (a) Ratnagiri and Bombay.	Mackerel . . .	Rupees per <i>hazari</i>	Annas per fish .	<i>Hazari</i> = 1,050 fish.
	Jew fishes (medium size).	Rupees per <i>sekda</i>	Do. . .	<i>Sekda</i> = 100-105 fish.
	Bombay Duck .	Basket measures .	Annas per heap .	1 measure = 25 seers approximately.
(b) Thana District.	Clams, oysters, etc.	Do. . .	Do. . .	1 measure = 10 seers approximately.
Madras— (a) South Canara and Malabar Districts.	Sardine, mackerel, horse-mackerel and silver-bellies (when shoaling).	Rupees per <i>kalli</i> .	Do. . .	1 <i>kalli</i> = 5.8 standard maunds approximately. <i>Kalli</i> means receptacles formed by laterally partitioning the hold of a fishing boat with bamboo <i>chick</i> .

Area.	Varieties.	Units of price quotation.		Equivalent in standard weights.
		Wholesale.	Retail.	
<i>1. Fresh fish—contd.</i>				
Madras—contd.	Mackerel . .	Rupees per 1,000	Annas per dozen	1,000 mackerel = 2.5 maunds.
	Sardine, Silver-bellies and Soles.	Rupees per <i>lakh</i> .	Do. . .	1 <i>lakh</i> of fish = 200-300 in a <i>unds</i> . (The fish are actually measured in baskets and the number computed after counting the fish in a few baskets.)
(b) All along the Madras Coast line.	Seer, pomfrets, Cat-fishes, Jew fishes, mullets, small sharks, etc.	Rupees per 100 fish.	Annas per fish .	Weight depends upon the size of the fishes.
	Large sharks, Jew fishes, <i>beckti</i> , Indian salmon, etc.	Rupees per fish .	Also sold on cut as annas per lb.	Do.
(c) Northern Circars.	Hilsa . . .	Annas per pair .	Annas per pair .	0.75 to 1.5 seers.
Mysore	Small cat-fishes .	Per basket measure.	Annas per heap .	1 measure = 12-18 srs.
	<i>Anabas scandens</i> , eels, "Live" fishes, carps, cat-fish, etc. Also sardine and mackerel imported from west coast.	Per 100-1,000 .	Annas per fish .	Weight depends upon the size of the fishes.
Orissa— (a) Cuttack and Khujang area.	All large varieties weighing over 2 seers.	Rupees per <i>katki</i> maund.	Annas per local seer.	1 maund = 40 seers of 105 tolas.
	Prawns and small varieties.	Rupees per basket. Also sold in heaps.	Do. . .	Do.
(b) Chilka	Estuarine varieties.	Rupees per whole catch in a net.	Annas per <i>vies</i> or by count.	
(c) Balasore	All varieties .	Rupees per standard maund.	Annas per seer .	
Bengal— (a) Barisal, Faridpur, Jessore, Khulna and other producing centres.	Hilsa . . .	Rupees per <i>kahan</i> Rupees per <i>pon</i> Rupees per <i>hali</i> .	Annas per pair . Sold on cut . .	<i>Kahan</i> = 1,280 fish. <i>Pon</i> = 80 fish. <i>Hali</i> = 4 fish.
	Beckti . . .			
	"Live" fishes .	Rupees per kerosene tin measure.	Annas per <i>powa</i> or <i>baissha</i> .	<i>Powa</i> = 32 fish. <i>Baissha</i> = 22 fish. 1 kerosene tin measure = 8-15 seers according to summer or winter. The fish is kept in water.
	Mango fish ( <i>Poly-</i> <i>nemus paradi-</i> <i>sicus</i> ).	Rupees per 100 .	So many per rupee	100 fish = 20-25 seers.

Area.	Varieties.	Units of price quotation.		Equivalent in standard weights.
		Wholesale.	Retail.	
<b>1. Fresh fish—concl.</b>				
(b) Calcutta	All varieties except mango fish, lobsters and oysters.	Rupees per standard maund.	By weight on out, or in small heaps according to varieties.	Mango fish, lobsters, etc., are sold as rupees per 100.
<b>2. Preserved fish.</b>				
Assam—Shillong	All varieties	Do.	Anna per seer	
Bombay— (a) Thana District.	Pomfret	Rupees per score	Anna per fish	Score = 21 pieces.
(b) At Sewri and North Canara and Ratnagiri Districts.	Sardine, mackerel, and other shoaling fishes.	Rupees per <i>kandi</i>	Anna or pies per heap.	1 <i>kandi</i> = 8 maunds.
	Bombay Duck	Per <i>chakki</i> or round.	Do.	The fish are tied into round bundles called <i>chakkis</i> . 1 <i>chakki</i> = 4,000 fish.
Madras— (a) West Coast	Sun-dried or salted sardine, mackerel and other shoaling fishes.	Rupees per <i>thulam</i>	Anna or pies per fish.	1 <i>thulam</i> = 16 seers at Cannanore. 1 <i>thulam</i> = 17 seers at Calicut. 1 <i>thulam</i> = 17.5 seers at Tirur.
(b) Koilpatti	Sardines, mackerel and other shoaling fishes salted or dried.	Rupees per <i>kattu</i>	Do.	1 <i>kattu</i> = 10.25 seers.
(c) Ongole	Do.	Rupees per <i>tooku</i>	Do.	1 <i>tooku</i> = 3 seers at Ongole. 1 <i>tooku</i> = 2 seers in South Arcot District.
Mysore	Small dried or salted varieties.	Rupees per maund	Anna per <i>viss</i>	1 maund = 12 seers. 1 <i>viss</i> = 120 tolas.
Orissa— Khujang, Puri, Sonapur, Chatarpur and Berhampur.	Cat-fishes, Jew fishes, sharks, prawns, hilas, etc.	Number of <i>viss</i> per rupee.	Anna and pies per <i>viss</i> .	<i>Viss</i> varies from 120 tolas at Berhampur to 180 tolas at Puri.

The table is self-explanatory. The unit in any one locality for a particular variety is seen to depend upon the volume of catch; when fish is plentiful, the largest unit is employed, e.g., *Kalli* for mackerel in South Canara and Malabar. The catches are disposed of on the beach immediately the boats land and in view of the rapidity with which the quality of the fish deteriorates under our climatic conditions and the large quantities that have to be speedily handled, it is not always practicable to weigh the catch before sale. Although there is not much of an inter-provincial trade in fresh fish, yet the absence of some system of price quotation gives rise in this trade also to all the disadvantages that have been noticed in the marketing of other commodities. In the large fishing ports of England such as Grimsby, Aberdeen, etc., the catch brought in by a trawler or a drifter is sorted according to species and then to sizes, "boxed" in standard containers and then only auctioned. In the fish curing yards in this country fish is admitted only on the basis of weights. The possibility of using "standard" baskets in the producing areas and inducing fishermen to quote on the basis of standard weights may be explored by the Provincial Fisheries Departments.

In the case of cured fish malpractices such as using non-standard weights and selling fish which is not fully dry are noticed in certain areas. This, however, is confined to wholesale transactions in assembling and terminal markets. In retail sale cured fish is mostly sold in small heaps costing a few pice per heap.

### B.—Factors affecting fish prices.

The following four factors mainly influence or determine the prices of fish and its products :—

- (i) The type of fish, its size, weight and quality.
- (ii) The purpose for which it is sold, i.e., for consumption as fresh fish or for curing or manufacturing purposes.
- (iii) The distance of the producing centre from place of consumption.
- (iv) The elasticity of demand.

Of the above, factor (ii) relates mostly to sea fish.

#### (1) TYPE OF FISH, ITS SIZE, WEIGHT AND QUALITY.

Besides market conditions differences in type, size, weight and quality considerably influence the prices of fishes. Varieties like pomfrets, seer, hilsa, beckti, Indian salmon, etc., among sea fishes are prized for their taste. In the following table the difference in prices between these varieties and cat-fishes, a group of fishes generally regarded as coarse, have been compared :

#### Price difference due to quality.

(Per maund.)

Name of the centre.	Prized variety.			Average annual price of cat-fishes.	Ratio of column (3) to column (4).			
	Name.	Average annual price.			Rs.	A.	P.	
1	2	3	4					
Karachi . . . . .	Seer.	6	12	0	5	12	0	1.17:1
Colaba district . . . . .	Pomfret.	11	15	0	8	0	0	1.49:1
South Canara & Malabar districts.	Indian salmon.	2	11	5	2	3	2	1.24:1
Tinnevelly district . . . . .	Beckti.	4	8	4	2	9	9	1.75:1
Bengal . . . . .	Hilsa.	7	12	0	4	13	0	1.61:1

These prized varieties fetch approximately the same premium in the cured state also.

Among freshwater fishes the favoured varieties are "live" fishes, carps and mullets. Carps and cat-fishes are available everywhere and the former fetch prices which are reported to be 15 to 20 per cent. higher than those for the latter in almost all inland markets.

Size is not as important a factor in determining the prices of sea fishes as it is in the case of the freshwater varieties. Most of the economic varieties of the former arrive in large shoals comprising fishes of almost the same size and weight. As regards freshwater fishes, however, large and small specimens of the same species are often caught in the same net particularly in the case of carps, cat-fishes, etc., which grow to enormous sizes. Up to a certain size, regarded as optimum for the species, beyond which the fish becomes coarse, prices per maund increase in proportion to the size of the fish.

For obvious reasons fish which is absolutely fresh fetches a better price than another specimen showing signs of taint. Consumers judge the quality of a fish by examining the eyes (which in a fresh specimen are full and prominent with a jet-black pupil): gills (which are red instead of grey and slimy): sheen (the natural sheen vanishes when scales become patchy) and above all, smell. Fish in the condition known as *rigor mortis*, when the flesh is firm and elastic is considered fresh. When purchasing on cut, consumers judge the quality by examining whether there is any discolouration around the backbone.

"Live" fishes that can be kept alive up to the time they are dressed are esteemed not merely for their so called nourishing qualities but also for the absolute freshness.

## (2) FISH SOLD TO MANUFACTURERS OF FISH PRODUCTS.

All curing and drying, as well as the manufacture of fish manure or fish guano, are carried on in rural areas on the sea coast from where, it is difficult to transport fresh fish to urban centres of consumption. These operations are undertaken on a large scale when there is a good catch awaiting disposal. Competition between fresh fish merchants and curers is rare except during years, when due to the general failure of the fishing season, the economic varieties are not caught in normal quantities. Under such circumstances prices also rule higher.

The fishermen prefer to sell their individual catches to merchants dealing with fresh and dried fish when the quantity available is small and, to the curers, when it is large, because the latter can buy larger quantities than fresh fish merchants whose demand is quickly saturated. The prices paid by the curers are invariably lower than those paid by fresh fish merchants, as shown in the following table in which the prices realized by fishermen selling their catches to these two groups of purchasers in two centres in the west coast of the Madras Province are compared:—

*Comparative prices per maund of fish sold for manufacturing into cured fish or fertilizers and for consumption as fresh fish.*

(Per maund.)

Name of the centre.	Date on which the price was collected.	Variety of fish.	Price realized when sold to fresh fish merchants.	Price realized when sold to curers.	Percentage of column (4) to column (5).
			4	5	6
1	2	3	Rs. A. P.	Rs. A. P.	
Malpe . . .	25-2-1942	Oil sardine.	1 6 0	1 2 8	84.9
Do. . . .	24-2-1942	Pomfrets.	4 6 0	3 8 0	80.0
Tanur . . .	29-3-1941	Mackerel (per 1,000)	3 7 0	2 15 0	85.5
Do. . . .	29-3-1941	Silver bellies.	1 14 0	1 11 0	90.0
Do. . . .	29-3-1941	Prawns.	2 9 0	1 11 0	65.9
Do. . . .	October, 1940	Sardine*	0 13 0	0 7 0	53.9

\*For manufacture of fishmanure.

It is further observed that the fishermen receive better prices from manufacturers when fish is bought for curing than for the production of fertilizers.

## (3) DISTANCE BETWEEN PRODUCING AND CONSUMING CENTRES.

The demand for fresh fish is mostly concentrated in towns and cities (see page 43 of this Report). Fish for consumption in urban areas is partly produced locally and is partly obtained from the adjacent fishing centres. Fish is sent packed with ice by rail, or as in the Bombay and Bengal Provinces in motor boats. River steamers and fast rowing boats are also employed to rush fish to Calcutta. When the import facilities are good and the quantity received for sale is large, the prices are low in urban consuming areas. In the table below the prices of fish in certain urban markets and in the fishing areas which supply them, are given:—

*Fish prices in producing and consuming centres.*

Consuming centre and name of fish.	Producing area.	Wholesale price in the producing area.	Wholesale price at the consuming centre.	Percentage difference.
		Rs. A. P.	Rs. A. P.	
<u>Bombay City—</u> Pomfrets . . .	Veraval . . .	2 0 0 per score.	9 8 0 per score.	375.0
Mackerel . . .	Bhatkal . . .	3 0 0 per maund.	12 8 0 per maund.	316.6

## Fish prices in producing and consuming centres—contd.

Consuming centre and name of fish.	Producing area.	Wholesale price in the producing area.	Wholesale price at the consuming centre.	Percentage difference.
		Rs. A. P.	Rs. A. P.	
<i>Calicut</i> — Oil sardine . . .	Beypore . . .	1 8 0 per maund.	3 8 0 per maund.	133.3
Jew fishes . . .	Tanur . . .	1 6 0 „ „	3 8 0 „ „	154.6
<i>Madras City</i> — Pomfrets . . .	Tanur . . .	2 12 0 „ „	7 8 0 „ „	172.8
Seer . . .	Tirur . . .	5 4 0 „ „	12 8 0 „ „	138.1
Silver bar fish . .	Ponneri . . .	3 5 0 „ „	6 4 0 „ „	88.6
<i>Cuttack</i> — Chilka fish . . .	Kaluparaghata . .	9 8 0 „ „	14 1 0 „ „	48.2
<i>Calcutta</i> — Hilsa . . .	Arial Khan area . .	4 12 0 „ „	17 8 0 „ „	268.5
Beckti . . .	Khulna . . .	10 0 0 „ „	40 0 0 „ „	300.0
Carps . . .	Mymensingh . . .	4 4 0 „ „	16 0 0 „ „	276.5
Prawns . . .	Khulna . . .	0 12 0 „ „	7 0 0 „ „	833.3
<i>Nagpur</i> —				
	Ramtek . . .	13 8 0 „ „	15 0 0 „ „	11.2
<i>Freshwater fishes</i>	Pauni . . .	12 4 0 „ „	15 0 0 „ „	22.4
	Bhiwapur . . .	10 0 0 „ „	15 0 0 „ „	50.0

It will be observed from the above table that in rural fishing areas the prices of fishes are lower than those in big towns and cities.

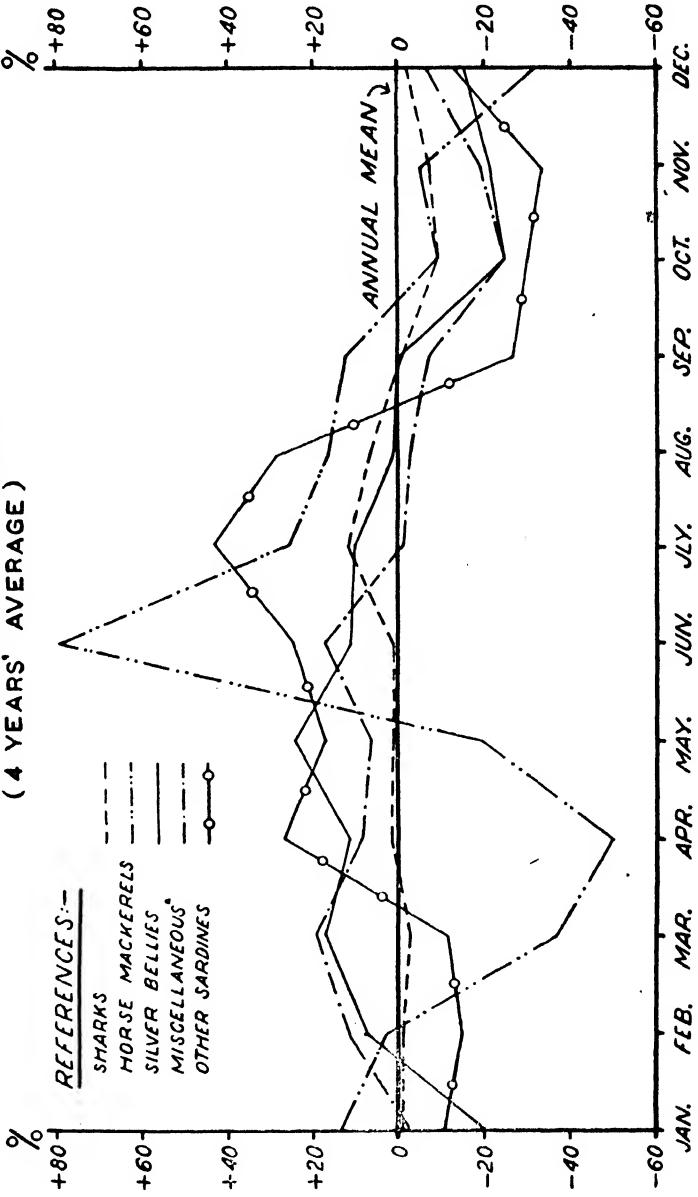
Prices of cured fish also vary according to the distance between the curing centre and the consuming market. In the following table the prices of salted cat-fish in Tanur and a few other markets are given to show that the cost increases with the distance:—

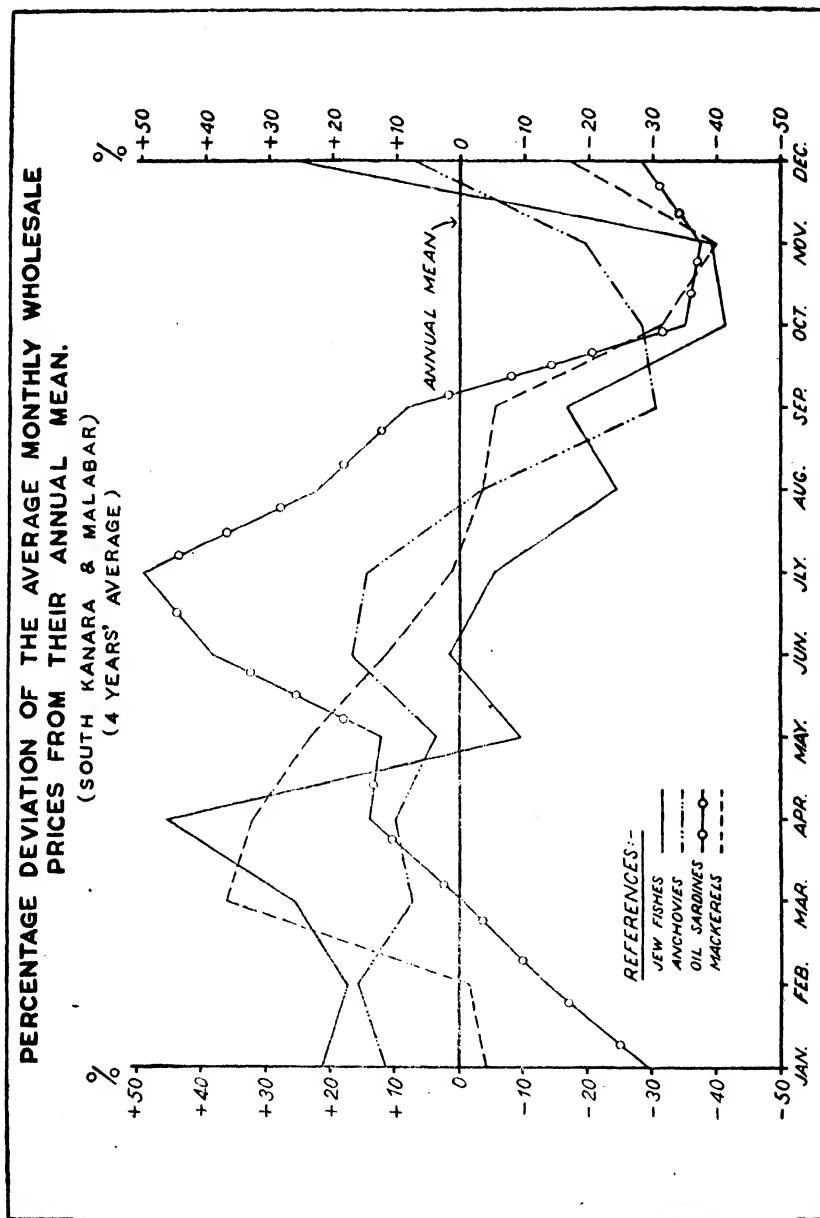
Name of the market.	Distance from Tanur.	Price at Tanur.	Price in the consuming market.	Percentage difference.
		Rs. A. P.	Rs. A. P.	
Orthanad— (Tanjore district) . . .	260 miles . .	5 12 9	6 12 0	16.5
Melapalayam— (Tinnevelly district) . . .	325 „ .	5 12 9	7 11 2	32.8
Dowleshwaram— (East Godavari district) . . .	796 „ .	5 12 9	7 14 5	36.3
Colombo . . . . .	..	5 12 9	9 8 0	69.9

## (4) ELASTICITY OF DEMAND.

The price of fish also depends upon the time when they are landed and marketed and on whether the day of sale is a "day of fasting" for the local consumers or a "day of rest" for the local fishermen. Good prices are obtained if the catches arrive early in the morning. At places which despatch fish packed with ice, fishermen try to return to suit the timings of the fish-carrying trains. When boats bringing in the catch arrive late in the afternoon, it becomes difficult to dry the fish in the sun or to apply salt and the prices, therefore, fall considerably.

PERCENTAGE DEVIATION OF THE AVERAGE MONTHLY WHOLESALE PRICES FROM THEIR ANNUAL MEAN.  
 (SOUTH KANARA & MALABAR)  
 (4 YEARS' AVERAGE)





Moplah fishermen of Malabar abstain from catching fish on Fridays. The fishermen of Travancore and Tuticorin are mostly Christians and they observe Sunday as a day of rest. On days when all fishermen do not go out for fishing supplies are limited and high prices prevail. On festivals when there is a greater demand than on ordinary days the prices run high but on Hindu fast days, e.g., *Amavasai* (New moon), *Karthigai*, *Ekadasi*, etc., in South India, fish is cheap.

#### C.—Wholesale prices of important varieties at the chief producing centres.

Fish, like milk has two prices—one which is realized when it is sold fresh for immediate consumption and the other when sold for the manufacture of fish products. There is usually a good deal of difference between the two prices. It has been shown in the chapter on "Demand and utilization" that only one half of the annual production is consumed as fresh fish. The proportion of the total catch utilized for sale as fresh fish and for manufacture of products depends upon the available supplies at any particular time. At the commencement of the fishing season, when only small amounts of a popular variety like sardine are caught, there is hardly any diversion of the catch for the manufacture of preserved fish.

Very few varieties are available throughout the year in any fishing area. The prices in any particular market are almost entirely determined by local factors such as quantities caught, the season (whether summer or winter), the proximity of a town in the neighbourhood, the type and cost of transport thereto, the existence of a fish curing yard at hand and even on weather conditions (rainy or warm and sunny).

The average seasonal wholesale prices of the chief groups of sea and freshwater fishes in some producing centres are given in Appendices XIII and XV. The prices of the different groups vary from area to area. In the important producing centres the wholesale prices are low. For instance, in South Canara and Malabar Districts of the Madras Province where 24.8 per cent. of the total Indian production of sea fish is landed, the prices are lower than in Sind, Orissa or Bengal. The popular varieties everywhere fetch higher prices than the coarser bony fishes.

Freshwater fishes are on the whole dearer than sea fishes.

The prices of cured fish depend chiefly upon the type of cure. Cured fish is mostly consumed by the poorer classes in the interior and many areas seem to demand products cured or sun-dried in a special way. The cost of production depends upon the system of cure, i.e., on the use or absence of salt, whether wet or dry-salted and the degree of dryage. The keeping quality of the processed fish has also a bearing on the prices. If a variety when simply sun-dried keeps better for a longer period than when cured with salt, the sun-dried fish fetches a premium, e.g., horse mackerels. Dried fish is food in a more concentrated form and its price appreciates proportionately with the amount of dryage. Prices of dried fish in a few markets for which data are available may be seen in Appendix XVII.

#### D.—Seasonal variations in prices.

The combined influence of the seasonal variations in supply (see page 17) and demand (see page 47) results in periodic fluctuations in the prices of fish. In the absence of data from all producing areas it is possible to examine in detail only the seasonal variations in prices in three coastal areas of the Madras Province. Similar fluctuations brought about mainly by local supply and demand conditions occur in other fishing areas also.

The monthly prices of nine economic groups of fishes in the three areas—one on the west coast and two on the Bay of Bengal coast—are given in Appendix XVIII.

The fishing seasons on the two coasts of the Madras Province to which the above data refer, are somewhat different. On the west coast production is concentrated during the period September to January when nearly 73.8 per cent. of the annual catch is landed, while on the Bay of Bengal coast, not within the belt of the south-west monsoon, the catch is more or less equally distributed during the different months of the year. This is reflected in the price quotations. On the west coast there are three distinct seasonal prices, e.g., September to January (the height of the season), February to May (ebb of the season), and June to August (fish scarcity due to monsoon). The prices are usually low during the post-monsoon period (September to January) and high during the monsoon period (June to August). On the Madras coast the fluctuations in prices are not regular or marked. Generally speaking, prices remain low during the first quarter of the year while they run high during August to November.

As is the case with all commodities whose production is seasonal, prices of fish are high at the beginning than when the season is well advanced. Besides increased supplies, satiation of the public taste for the product also plays a part in this decline.

Shoals of the economic varieties approach the shore during different months: consequently the cycle of variations in prices is distinct for each variety. These changes, expressed as the percentage deviations of the average monthly prices from their annual mean, for thirteen economic groups caught along the west coast of the Madras Province are shown in the diagrams facing pages 54 to 56.

It will be observed that while the general trend of variations is the same for all the groups the range of deviation is markedly different. During the period September to January prices of almost

all varieties are below the annual average mean. From January, ~~January to June~~ deviations become positive and as the year advances the range of deviations steadily increased culminating in high points during April-May. The annual range is smallest in the case of sharks in which it varies from  $-9.5$  in October to  $+11.6$  in July. In the case of sharks, oil sardine, Jew fishes, silver-bellies, prawns and "miscellaneous" the lowest points are in October, the lowest point occurs during November for oil sardine and mackerel, and in December for pomfrets. Cat-fishes and horse-mackerels show the lowest points in June and April respectively as compared with other varieties which touch highest points between March and July. The highest point in the case of cat-fishes occurs in December. The maximum deviation, *viz.*, from  $-50.0$  in April to  $+79.6$  in June representing an average price deviation of Rs. 1.15-9 per maund is noticed in the case of horse-mackerels.

The percentage deviations of the monthly wholesale prices from their annual mean in respect of Jew fishes, sardines (other than oil sardine) and cat-fishes in the three fishing areas of the Madras Province are shown in the diagram facing page 57. The three areas are representative of distinct geographical and meteorological conditions and the deviations therefore show markedly conflicting trends. In the case of Jew fishes while the minimum and the maximum points are touched in October and April respectively in the west coast, the corresponding months are August and January in the southern section (East coast) and November and September in the northern section. While the percentages vary from  $-39.3$  to  $+45.9$  in the west coast the range is only  $-11.6$  to  $+7.1$  in the northern section of the east coast. For cat-fishes the smallest range is observed in west coast while the largest is in respect of the southern section of the east coast. In both sections of the east coast the fall in prices is less abrupt than on the west coast in respect of all the three varieties.

It has already been shown (see page 47) that in the plains of India wide variations occur from province to province and even from district to district in the same province in respect of the monthly supplies of fish. Generally speaking, the demand for fish is low during the summer months, but due to the difficulty of keeping fish wholesome, prices are somewhat high. During June-August in such areas as receive rains, the weather cools down resulting in an improved demand after the onset of the monsoon. The production, however, falls due to difficulty in fishing in the flooded rivers and tanks. The prices consequently rise. From October onwards both production and demand increase and a new price equilibrium comes to be established.

The available data regarding monthly prices of cured fish are given in Appendix XVI. In all these markets, products from the local fish curing yards and the stuff imported from Malabar, South Kanara, Cochin and Travancore are sold side by side. It is difficult to trace any periodicity in the monthly prices of cured fish.

#### E.—Trend of fish prices.

##### (1) FRESH FISH.

In the absence of regular records showing fishermen's prices over a series of years, it is very difficult to examine the trend of fish prices in India. The index numbers of the average annual wholesale prices for sardines, Jew fishes and cat-fishes in the three fishing areas of the Madras Province given in the table below may give some idea of the trend:—

*Index numbers of the annual average fish prices in the three fishing areas of the Madras Province.  
(1936-100.)*

	Year.	Jew fishes.	Cat-fishes.	Sardines.
South Canara and Malabar . . .	1937	72	91	64
	1938	103	102	107
	1939	90	113	114
Madras East Coast, Southern Section .	1937	92	100	101
	1938	102	98	116
	1939	103	107	103
Madras East Coast, Northern Section .	1940	109	107	100
	1937	92	86	84
	1938	97	77	99
	1939	97	87	74
	1940	90	84	71

PERCENTAGE DEVIATION OF THE AVERAGE MONTHLY WHOLESALE  
PRICES FROM THEIR ANNUAL MEAN.

(SOUTH KANARA & MALABAR)  
(4 YEARS' AVERAGE)

%

%

%

%

%

%

%

%

%

%

%

%

%

%

%

%

%

%

%

%

%

%

%

%

%

%

%

%

%

%

%

%

%

%

%

%

%

%

%

0

+30

+20

+10

0

-10

-20

-30

-40

-50

-40

-30

-20

-10

0

+10

+20

+30

+40

+50

+60

+70

JAN. FEB. MAR. APR. MAY. JUN. JULY. AUG. SEP. OCT. NOV. DEC.

ANNUAL MEAN

CAT-FISHES

POMFRETS

—○— PRAWNS

—○— SEER

REFERENCES:-

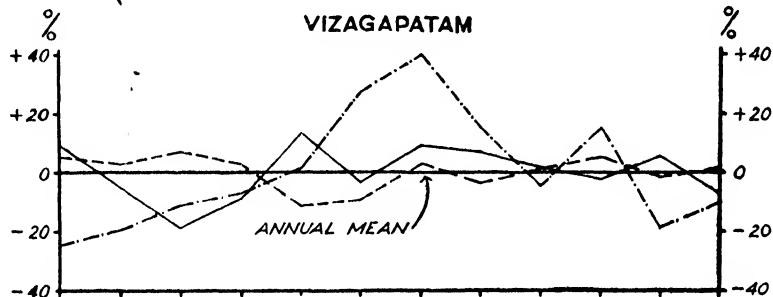
CAT-FISHES  
POMFRETS  
PRAWNS  
SEER

PERCENTAGE DEVIATION OF THE AVERAGE MONTHLY PRICES  
FROM THEIR ANNUAL MEAN IN RESPECT  
OF CERTAIN VARIETIES IN THREE  
PRODUCING AREAS.  
(4 YEARS' AVERAGE)

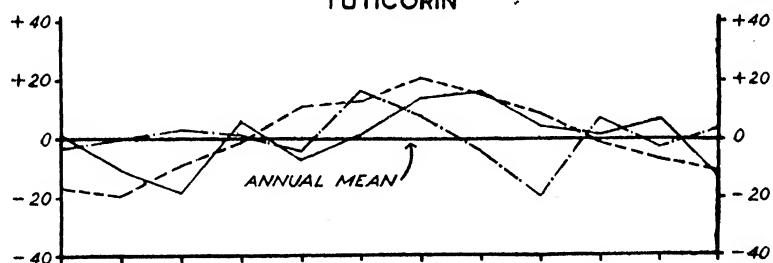
REFERENCES:-

CAT FISHES —————  
JEW FISHES -----  
SARDINES - - - - -

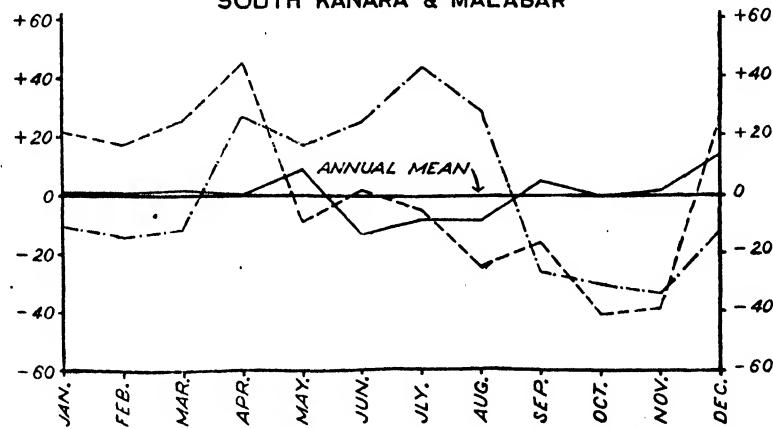
VIZAGAPATAM



TUTICORIN



SOUTH KANARA & MALABAR



Since the prices depend upon several uncertain factors which may change from day to day, the erratic trend shown by the above figures is not surprising.

Prices of fish in cities, important civil and military stations and commercial centres, have risen considerably after 1940. For instance, at Jubbulpore the average price of fresh fish in 1941 had risen by 36·3 per cent. and at Hoshangabad by 60 per cent. over the 1939 level. The prices of dried fish had gone up by 28 per cent. at Akola and 19·6 per cent. at Khandwa during the same period. The rising prices in consuming centres have benefited the fish trade only to a negligible extent. Lack of transport and shipping facilities and the loss of markets in Burma, Straits Settlements and the Dutch East Indies, on the other hand, have hit the industry severely in the large marine producing centres. In Cochin State, for example, prawn-culture, in paddy fields which adjoin the backwaters, has practically ceased as cured prawns cannot be exported to foreign markets.

Until arrangements are made for the utilization within the country of the surplus in the fishing areas by increasing the up-take of cured and dried fish by the inland markets, the slump in prices in producing areas will continue. The fisheries departments in the provinces and States can render help by suggesting improved methods for preserving fish and by carrying on propaganda for the increased consumption of processed fish. Being a food article, priorities for transport during the war time may not be difficult to arrange.

#### (2) FOREIGN TRADE.

It has been possible to calculate long-range prices only from the "declared values" of preserved fish imported into and exported from India. The annual declared values of the chief varieties traded in, as classified in the custom's returns are re-produced in the following tables:—

##### *Declared values of fish products imported into India.*

(Rupees per cwt.)

—	Fish, dry, unsalted.	Fish, dry, salted.	Fish-maws and shark-fins.	Fish, wet, salted.	Total fish (excluding canned fish).	Canned fish.
	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.
1936-37 . . .	3 12 4	9 6 6	3 10 1	8 10 8	11 2 5	47 14 0
1937-38 . . .	2 4 10	7 0 6	6 7 3	9 5 10	8 12 6	49 0 10
1938-39 . . .	3 7 8	5 12 10	8 5 10	9 6 5	7 5 0	48 1 6
1939-40 . . .	2 15 7	7 10 1	6 15 9	10 6 5	7 3 7	53 4 9
1940-41 . . .	2 15 6	10 1 4	6 15 1	10 8 6	5 15 9	58 7 3

It will be observed from the above table that in the case of the first three products the declared values show an erratic trend. The declared value of wet salted fish shows a steadily increasing trend. But the total declared values of all the four products clearly shows a downward trend. On the other hand the declared values of canned fish, which is imported from distant countries, show an upward trend, which is quite pronounced after the out-break of the present hostilities.

##### *Declared values of fish products exported from India.*

(Rupees per cwt.)

—	Fish, dry, unsalted.	Fish, dry, salted.	Fish maws and shark-fins.	Fish, wet, salted.	Total fish excluding canned fish.	Fish manures.
	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.
1936-37 . . .	20 13 3	17 7 8	106 10 0	7 15 11	20 2 3	3 13 11
1937-38 . . .	19 8 6	18 15 6	99 6 10	9 7 2	20 6 7	4 5 11
1938-39 . . .	20 13 9	17 7 8	86 10 8	8 0 4	20 10 0	4 0 6
1939-40 . . .	20 0 10	16 4 0	86 10 9	10 1 11	19 8 0	4 10 8
1940-41 . . .	22 1 3	12 15 7	63 9 8	5 2 1	18 4 2	4 9 6

The demand for dry and wet salted as well as unsalted fish abroad largely arises from the members of the Indian communities who have settled in tropical and sub-tropical foreign countries.

As in the case of imports the declared value of total fish excluding canned fish, shows a slow downward trend during the quinquennium ending 1940-41. This is well marked in the case of 'Fish-maws and Shark-fins', the declared value of which during 1940-41 was only 60 per cent. of the declared value during 1936-37. Large quantities of wet and dry-salted fish used to be exported to Burma and Malaya. The declared values of these went down by nearly 50 and 25 per cent. respectively during 1940-41 when compared with the values in previous years, due to the disturbed conditions in the East. The slump in prices due to the war conditions is well illustrated by the above figures.

It will be observed that the declared values for all varieties exported except wet-salted fish, is more than the corresponding declared values for imports. The difference is very marked in the case of unsalted fish and Fish-maws and Shark-fins which during 1936-37 were 6 and 30 times the respective declared import values. This shows that cheap and inferior products are imported for consumption in deficit areas of this country while the quality of preserved fish dispatched abroad is considerably superior.

#### F.—Note on prices of fish fertilizers, fish oils, etc.

The qualities of fish guano and fish manure produced in various tracts differ considerably and the prices of these products also show extreme variations. The buyers quotations in Ceylon,—the chief market for fish fertilizers—are based on the Nitrogen and phoosphoric acid contents of the fertilizer with tolerance for sand. Manures conforming to the standard Ceylon specifications are not usually available. The fertilizers are not analysed; a sample is examined and the price is settled. The fertilizers without any further treatment are exported to Ceylon.

Fish guano fetches a better price than fish manure. During the five year period ending 1939-40, Colombo quotations for guano ranged from Rs. 62.00 to Rs. 78.75 per ton while the prevailing prices in the west coast area were Rs. 39.8-0 to Rs. 42.3-0 per ton. Fish manure registered an increase of Rs. 2.8-0 during the same period to touch Rs. 32.8-0 per ton in 1939-40 in the west coast area. The Colombo quotations for fish manure moved in sympathy to touch a maximum of Rs. 60.50 per ton during 1939-40.

Regarding fish oil also, in the absence of any standard specifications the quotations vary over a very wide range in the different producing centres. In recent years, however, due to a general decrease in the production of oil, the average prices have shown an increase. The prices in the Madras west coast area rose from Rs. 175 in 1935-36 to Rs. 225 per ton in 1939-40.

Fish fertilizers and fish oil are manufactured during October-November when the prices remain low. Fish manure and guano are generally marketed before the end of January.

Bombay is the chief export market for fish-maws and shark-fins. Maws and fins are classified by Bombay merchants for the purpose of price quotations. Large maws from jew fishes and Indian salmon go under the trade description *Potu* and the small under *Poti*. Similarly maws from cat-fishes are called *Pok* and *Bitki*. Maws blackened by blood are called *Badla*. Generally speaking, the smaller maws fetch about 50 per cent. of the larger ones of the same grade, while *Badlas* sell at a discount which is as high as 50 per cent. The Bombay rates in 1940 were Rs. 40.50 for large maws from jew fishes, Rs. 30-35 for those from eels, Rs. 40-45 for Indian salmon and Rs. 6-7 for cat-fishes.

Bombay quotations for shark-fins were influenced by the price fluctuations for this product in Hong Kong. Broadly speaking the fins are classified into two grades; the white and black and these are further divided into three sub-classes according to size, viz., large, medium and small. The white varieties fetch on an average three times the price of the black fins belonging to the same sub-class. The Bombay rates during 1940 ranged between Rs. 21-27 for the black variety and Rs. 63-72 for white fins.

#### G.—Note on prices of canned and bottled fish.

These are imported products and are not manufactured in India. Their declared values (import) have already been given in Chapter I. The retail prices of some of the important types and brands prevailing in most of the towns and cities in 1939 (before the War) are given in the following table:—

## Prices of canned and bottled fish.

Name of the product.	Unit.	Price.
Anchovies in oil . . . . .	4 oz. x 12 bottles.	9 0 0
„ in butter . . . . .	1 lb. x 1 „	1 12 0
Kippered herrings . . . . .	1 lb. x 12 tins.	6 4 0
Herrings in tomato sauce . . . . .	do.	4 12 0
Bloaters . . . . .	do.	13 8 0
Herring Roes . . . . .	½ lb. x 1 „	1 2 0
Salmon Red . . . . .	1 lb. x 12 „	8 0 0
„ Pink . . . . .	do. „	4 0 0
Lobsters . . . . .	½ lb. x 12 „	8 8 0
Oysters . . . . .	½ lb. x 1 bottle.	1 4 0
Prawns . . . . .	do. „	0 14 0
Finnan Haddock . . . . .	1 lb. x 1 tin.	1 2 0
Shrimps . . . . .	5½ oz. x 12 bottles.	7 0 0

## H.—Market intelligence.

The localised character of the demand and the lack of recognised standards of qualities are largely responsible for the absence of a market intelligence service for fish. In towns and cities where the trade is somewhat organized, the merchants and commission agents keep themselves in touch with the prices prevailing in producing areas. The fisherman, unless he has himself been to the market, gets the news from his neighbours who have recently visited the local assembling centre. Under these circumstances it is unlikely that the information reaching the fishermen can be accurate or up-to-date.

In the case of fish despatched for sale in urban markets from distant fishing centres, sale on commission basis is very common and the commission agents keep the consignors informed about the price ranges of the important varieties, by weekly or fortnightly quotations. From Ceylon, an important market for preserved fish produced in the maritime districts of South India, weekly price lists on printed forms are received by the big exporters, from commission agents in Colombo. The market position in respect of arrivals or stocks is not, as a rule, revealed in any of these communications. Very often these quotations are misleading and result in loss to the consignors.

The Madras Fisheries Department embarked on a scheme to disseminate the ruling prices of chief varieties of cured fish in five presidency markets, by deputing a member of the staff to collect prices on the market days and distributing a bulletin showing the compiled prices to all fish curing yards and fishery schools. The recipients of the bulletin were instructed to give wide publicity to the latest rates among fish merchants and curers. This scheme was mainly designed to prevent the accumulation of stocks in any market. This useful service was started in November 1939, but unfortunately has been discontinued since November 1941.

## CHAPTER VII.—ASSEMBLING STORAGE TRANSPORTATION AND DISTRIBUTION.

## A.—General background.

Fish is landed at very many centres in India. Fishermen visit only the nearby fishing grounds. Some at a few centres, may have fortune and strike a big catch rapidly. Others may not be so fortunate and may return only after a longer period and at a time inconvenient for the marketing of the catch. In one case the fish caught may be of a size and variety very acceptable to the consumers, in another they may be poor. No effective means of regulating the catch exist, particularly in regard to marine fisheries, and none of fore-telling the varieties of fish that would

be landed. On account of the perishable nature of fish, the total landings have to be cleared daily and supplies wherever they have been landed are brought direct to the nearest assembling centre and rapidly sold. The owner's (fisherman, middleman or retailer) main desire is to sell at once. The chief economic need of the industry, it would appear, is to secure a more uniform supply: since it cannot, from the nature of the case, lie in a regulation of the quantities landed it must be found in the process of marketing. Under the present conditions, an immediate market is imperative, with the result that there are sometimes gluts and sometimes shortages. If supplies could be stored, even for a short period, without deterioration, the conditions of the trade would be revolutionised. Storage facilities for fresh fish are almost wholly not available.

The fishermen; i. e., those who actually catch the fish, play only an insignificant part in the disposal of the catches. Their task generally ends when boats have been brought to the shore. The members of the fishermen's family do the preliminary assembling but the final assembling and distribution of the catch are generally done by merchants or commission agents who step in at this stage. If facilities for sending out fish are available at the fishing centres, certain varieties, e.g., pomfrets, seer, perches, large prawns, etc., are sorted and despatched to the nearest towns and cities where they are in demand: otherwise, preserved fish or fish manure is made out of the whole catch.

The average consumer in this country finds fish costly. The fisherman, however, gets only a small proportion of the price paid by the consumer. The fish trade in all countries is beset with similar problems due to the material of the industry not being a stationary object. In this country, custom, religion and prejudices and ignorance on the part of the distributive trade and the buying public introduce further complications in the industry which is scarcely, if at all, organized.

## B.—Fishing population.

### (1) FISHING COMMUNITIES.

The fishing castes of India present many features of great interest, which are survivals of manners and customs dating from very remote times. According to ancient Hindu legislation fishermen belong to the *Shwara* or servile caste. In many coastal areas there are still two distinct types of fishermen: (i) those who capture fish a few miles out in the sea, (ii) those who pursue their avocations from the shore or fish in backwaters and creeks. In the Malabar district, men who capture fish with hooks and lines cannot take part in fishing operations with nets and vice versa. In the Chilka Lake, certain castes are permitted to fish only with fixed engines, viz., bamboo screens and traps, and cannot use nets. Again in the Chilka area, certain castes can only capture fish while certain other castes can only market fish. Although the old-time conventions are now less strictly observed and fishermen have taken to other occupations, these still exert a great influence on the organization of the industry in most parts of the country.

The marine fishing population consists of Hindus, Muslims and Christians; in different coastal areas one or the other of the communities predominates. In Sind, the fishermen are all Muslims. Muslim tribes like Daldis, Pudu Isams, Mappillas, etc., and Hindu fishermen belonging to Bihis, Kolis, Mukuvas, Mogers, etc., castes are found in equal proportions along most parts of the West Coast. Roman Catholic Christians predominate in Central Travancore, and in the Palk Strait Bay area. Along the Coromandal Coast the number of Hindu fishermen exceed those belonging to other communities. In the Madras Province, fishermen have customs of a patriarchal nature which is, however, more strictly observed on the Coromandal than on the West Coast. Under this system immense hereditary powers are held by certain individuals. The fishing villages (called *Kuppanas*) have hereditary or elective headmen and hereditary priests who are the final referees in all fatuity and caste disputes.

### (2) NUMBERS ENGAGED IN THE INDUSTRY.

In the All-India Census Report, 1931\*, under the heading "Occupation", fishermen have been shown under the sub-groups "Fishing and Hunting" and "Fishing and Pearl". Each of these sub-groups is further divided into "Total earners principal occupation", "Total working dependants" and "Total following occupation as subsidiary to other". The number of hunters are separately reported.

The actual capture of fish is exclusively the job of a male. The fisherwomen actively co-operate in transporting fish on head-boards, and as assemblers, cutters or retailers. In the absence of recent data the figures relating to the fishing population from the All-India Census Report for 1931, in certain provinces and States are reproduced in the following table in a reclassified form.

\* Note.—Classified occupational tables relating to the 1941 human census have not so far been published

*Classification of the fishing population.*

(Compiled from the All-India Census Report, 1931.)

Province/State.	Adult fishermen (workers).		Assemblers, retailers, etc.		Total fishing population.	Percentage of workers to total fishing population.	Ratio of number of workers to assemblers and retailers.
	Number.	Percentage to total.	Female workers (whole-time).	Working dependents (males and females).			
Assam . . .	34,584	6.28	841	5,786	114,824	30.1	100 : 19
Bengal . . .	158,624	23.81	26,123	6,293	464,457	34.2	100 : 20
Bihar and Orissa . .	42,108	7.65	9,100	1,348	124,182	33.9	100 : 25
Bombay (Sind) . .	47,210	8.57	12,308	8,970	147,714	31.9	100 : 45
Central Provinces and Berar . . .	36,006	6.54	5,804	2,959	108,116	33.3	100 : 24
Madras . . .	117,467	21.33	34,812	13,016	355,850	33.0	100 : 41
Punjab . . .	3,296	0.60	12	259	10,121	32.6	100 : 8
United Provinces .	14,417	2.62	3,468	2,330	46,095	31.3	100 : 40
Baroda State . .	1,230	0.22	729	51	3,627	33.9	100 : 64
Bihar and Orissa States	5,143	0.94	1,010	256	15,110	34.0	100 : 35
Central India Agency .	3,496	0.64	338	151	10,228	34.2	100 : 14
Hyderabad State .	33,578	6.10	14,864	15,701	120,827	27.8	100 : 91
Jammu and Kashmir .	1,241	0.22	47	165	3,725	33.3	100 : 17
Cochin State . .	8,155	1.48	846	290	23,916	34.1	100 : 14
Travancore State .	31,545	5.73	2,540	4,035	101,745	31.0	100 : 21
Other areas . . .	12,510	2.27	2,294	2,399	39,088	32.0	100 : 38
<b>Total .</b>	<b>560,610</b>	<b>(100)</b>	<b>118,136</b>	<b>63,999</b>	<b>1,689,625</b>	<b>32.6</b>	<b>100 : 33</b>

It will be observed from the above table that the largest number of workers, *viz.*, 28.8 per cent. of the Indian total, is found in Bengal. This is followed by Madras Province with 21.3 per cent. Among the States, Hyderabad, although it has no sea-board, leads with 6.1 per cent. closely followed by Travancore with 5.7 per cent. In every province and State for every 100 of the fishing population there are roughly 30 adults engaged in fishing. The ratio of the number of persons who actually do the fishing to working dependents (assemblers, curers, retailers, etc.), however, varies from place to place. The largest number of dependents, *viz.*, 91 persons to 100 fishermen is found in Hyderabad, followed by 64 in Baroda State. In the Punjab the corresponding number is only 8. The number of female workers is found to be large in Bengal, Bombay (Sind), Madras and Hyderabad State. This is because the retail distribution of fish in these areas is almost wholly in the hands of females.

The fishing population constitutes only 0.5 per cent. of the population of India (1931).

No figures are available to show the number of non-fishermen who depend upon the fishing industry for a living. To this class belong the merchants, middlemen, commission agents, labourers (engaged for transporting, curing, drying and packing fish), boat-builders and net-makers.

There are several factors which determine the earning power of the fishermen operating in the different fishing areas. According to an estimate prepared by Dr. H. T. Sotley in 1931 for the Bombay (Sind) Province, the average *per capita* earning is highest in the case of marine fishermen

who supply the Bombay city, being nearly double that of fishermen in the North Canara villages.\* Unfortunately figures have not been worked out for the other areas in India. It may, however, be stated that the sea-fishermen are well off in Sind; miserably poor in Bombay except in the vicinity of larger towns; are in a fair condition from South Canara down the entire West Coast of India, but once round the Cape Comorin they again appear as a poverty-stricken race of people and continue so up the whole of the Coromandal Coast.

In India, fishing is a hereditary profession among certain communities and in developing the industry for the benefit of the consumer, the producer should be given due consideration for the development ultimately rests with him.

### C.—Methods and agencies of assembling.

The marketable surplus of fish is disposed of by the members of the fishermen's family (i) either by themselves taking it to the nearest market or assembling centre, or (ii) by selling at the landing ghats to intermediaries who take it to the assembling centres. These intermediaries include agents of middlemen—boat-owners and curers, village merchants and itinerant dealers. Fish merchants play an important part, especially in the coastal areas of South India, in the assembling (and distribution) of fish, functioning in the triple role as wholesalers, commission agents and curers.

The quantities of fish brought to assembling markets by fishermen and other intermediaries vary from day to day in different markets depending upon the total supplies.

#### (1) FISHER-FOLK.

The fishermen catch the fish and its disposal is left chiefly to other agencies. Along the coastal areas, the fisher-folk (members of the fishermen's family) collect the catch from the boats and do the preliminary assembling. If there is a consuming market in the neighbourhood the fisher-folk take the fish direct to consumers. Owing to the perishable nature of the commodity, transit from producer direct to the consumers is possible only when the market is within a distance of 10 miles from the producing centre. The services of middlemen are requisitioned for marketing the catch in all other cases. The producers, i.e., fishermen and their families usually play only a small part in the marketing of fish as their financial obligations leave them little choice for disposing of their catches except to the creditors. Short-term loans are generally taken by fishermen, which are repayable, mostly in kind, during the fishing season, from village merchants and curers and fish is sold to them. These agreements are generally verbal understandings. When the fish is sold to, or through them, low or no interest is charged. The prices paid to debtor fishermen are somewhat lower than the current local prices. In the coastal areas of the Madras Province the difference is sometimes as high as 25 per cent.

Riverine fishing is usually conducted by parties of fishermen who move in batches in search of fish. These parties assemble their catches at suitable centres, located on the river bank, where commission agents await them.

#### (2) MIDDLEMEN BOAT-OWNERS.

These persons, by virtue of their position as financiers have a great hold on the producers. The boats and nets used in coastal fishing are mostly owned by non-fishermen. Only very few fishermen own the necessary boats and gear. Fishing operations are conducted by parties consisting of 3 to 10 or even twenty persons. The catch is usually shared among the fishermen and the owners of the boats and nets. Although each member of the fishing party is free to sell his share in any manner he pleases, the boat-owners manage to corner the whole catch. It happens in the following manner: The boat-owner's share of the catch is often considerable, always exceeding the share of any individual fisherman. He has to arrange for the disposal of the fish. He is willing to purchase the shares of the fishermen also and handles the total quantity. As the fishermen have to depend upon him for the continued use of the boat, they accept the price offered by the boat-owner, even when it is lower than the prevailing market rates. Most of the middle men boat-owners are also "ticket holders" in fish curing yards, when such exist in the neighbourhood.

There is another type of middleman boat-owner found in the Bombay supply area. He keeps first sailing boats—no fishing operations are conducted from them—which meet fishing boats in the producing areas. These middlemen make an annual contract with the fishermen for the supply of fish at agreed rates.

The power-propelled boats which bring fish supplies to Bombay and Calcutta visit the surrounding fishing areas and buy fish from different fishermen for cash. Contract rates are not in vogue but ceiling prices for the different varieties are fixed for the guidance of his agents by the boat owner, who is an urban wholesale merchant.

\* H. T. Sorley: *Marine Fisheries of the Bombay Presidency* (1931), p. 42.

### (3) PETTY AND WHOLESALE MERCHANTS, CURERS AND MONEY-LENDERS.

In the coastal areas and in every freshwater fishing centre there are many petty dealers who work independently with their own capital. The amount they require for their daily business is ordinarily Re. 5 : it never exceeds Rs 10. They go to the landing *ghat* on the beach or on the river bank and buy the individual shares of one or more fishermen. Having secured fish they walk fast—they run almost—to the nearest village or town market. Fish is also sold to consumers on the way. Of late bicycles are being used by these people, the basket containing fish being tied to large stout planks which serve as "carriers" on these bicycles. These petty merchants in the coastal areas carry on business with salted or dried fish also. If fresh fish is scarce on a particular day, they purchase dry or salted fish instead from curers which also is duly sold in the above manner. It is generally observed that these petty dealers visit the landing *ghats* only on alternate days.

The wholesale merchant in the producing area is usually also a commission agent and a fish curer. He buys both fresh and cured fish. He has a number of paid labourers under him. Some of them are sent to the fish landing *ghats* to expeditiously collect fish that are suitable for sending as iced fish. He would have given to fishermen loans in cash or in kind, e.g., provisions, boats, or fishing notes on the understanding that fish would be sold to him. The "choice varieties" are despatched, packed with ice, to urban markets while the remaining quantity is used for curing, sun-drying, or for the manufacture of manure, fish oil, etc., depending upon the available varieties and supplies.

Commission agents and wholesalers in urban consuming areas receive fresh fish (i) from producers in the neighbourhood, (ii) from their agents who have gone in boats to buy fish from fishermen (Bombay and Calcutta) and (iii) from wholesale merchants in producing areas. Any convenient site to which fish consignments can be easily transported is chosen by these persons for assembling the fish. For example, special siding in the Sealdah Station at Calcutta, an open place within the railway compound near the Basin Bridge Station at Madras, the Arthur Crawford Market at Bombay and the Khudda Market at Karachi serve as assembling and auction centres. In Calcutta there are special assembling centres for particular groups of fishes, e.g., Ultadanga for "live" fishes and Hatibagan for prawns.

Cured or dried fish from producing areas are also assembled by commission agents on behalf of the curers in consuming centres. The consignments are first taken to godowns of these agents and are assembled in the next weekly market. The godowns are usually adjacent to or sometimes within the market enclosures. In Bombay, where very large quantities of cured and dried fish are assembled, special huts have been constructed by the Bombay Corporation and hired to wholesale merchants and commission agents for storing fish. Similarly, in weekly markets in inland areas, especially in South India, the market authorities have constructed special huts for the storage of cured fish.

In Chittagong and a few other areas in Bengal money-lenders (*mahajans*) assemble dried fish. They advance money to leaders (*bahardars*) of fishing parties who go in October to the uninhabited islands such as Rangabali, Bansdia, Sonadia, Kalidaha, etc., in the Sunderbans for catching and drying fish. These advances are given on the security of fishing implements and boats. The *bahadar* also signs a bond agreeing to repay the advance during the fishing months, *in kind*, generally at the rate of 20 to 25 maunds of dried fish for every Rs. 100. The fish as soon as caught and dried are taken over by the *mahajan*'s agents at the place of fishing and brought to Chittagong. The cost of transport is borne by the *mahajan*. It is estimated that annually dried fish worth Rs. 8½ lakhs is assembled in this manner.

### (4) CO-OPERATIVE SOCIETIES.

Although there are over 200 fishermen's co-operative societies which finance their members and sometimes assist them in the sale of cured fish, the number of these institutions which undertake the assembling and distribution of the members' catches is very few.

There are only six societies doing non-credit work in the South Canara and Malabar districts of the Madras Province, one society in Orissa and two in Bengal. It may be mentioned here that the model bye-laws for Fishermen's Co-operative Societies in all provinces, *inter alia*, provide for the joint sale of the members' produce. The method of working of few typical non-credit societies are described below.

The Ajanur Fishermen's Co-operative Society, South Canara, during 1941 attempted the pooling of the catches of the members with a view to selling them either fresh, cured or converted into manure, through other co-operative sale societies in the Madras Province. The Society was granted a "ticket" in the Hosdurg Fish Curing Yard during 1942, the first time that a corporate body was granted a "ticket" in a fish curing yard. Loans are granted by the Society, generally, to only such of the members as would undertake to sell their catches through the Society. The catches are pooled and cured in a hygienic way by members themselves under the supervision of the Directors of the Society. The cured articles are sold in distant markets and proceeds are shared by the members who contributed to the pool according to their individual shares. The Society intends to purchase boats and nets to be hired at nominal

rates to members. When the assembling of fish and its preparation for the market are undertaken co-operatively by more and more producers, it would be necessary to open depots in outside markets for marketing the products. A co-operative society will have a better bargaining power than any individual producer; it can adopt improved methods of curing and can also market the products more efficiently. It is reported that other societies in South Canara are copying the example of the Ajanur Society, and that the Madras Co-operative Department has a scheme for opening depots in consuming areas for marketing the produce of the fishermen co-operative societies on a commission basis.

Fishing in inland waters such as rivers, tanks, etc., is not unrestricted as in the sea. A co-operative society for inland fishermen has to take on lease the right for fishing in "private" waters. The lease should be for an extended period in the case of a tank or lake and the society has to stock the confined water with fry or fingerlings of marketable varieties. The Bidhadhari Spill Matsyajibi Samabaya Samity, Datterabad (near Calcutta) has obtained on lease the swampy margins of the Bidhadhari river from Government and is assembling and marketing fish caught from these waters with the help of the fishermen-members. The Society consists of about 86 members who are all fishermen of the locality. Boats and nets to catch fish are provided by the Society. The entire catch is handed over to the Society which after weighment (see lower plate facing this page) is sold every morning by auction on the spot to wholesale or usually retail fish-merchants. The entire quantity is sold in retail in the Calcutta markets.

The Chittagong Matsyajibi Samabaya Samity Ltd., registered in 1938 seeks to help the Chittagong fishermen who fish in the Sunderbans area. The Society out of a loan annually taken from the Provincial Co-operative Bank, advances money to solvent *babardars* at 12 per cent. interest on the security of boats, nets and other unencumbered material assets. The catches are dried and made over to the Society, at the fishing sites, and the Society undertakes to sell the same, as early as possible, without waiting in a speculative spirit. The sale proceeds after repayment of the borrowed capital with 6 per cent. interest and meeting the establishment charges is distributed among the *babardars*. The *babardars* are granted liberal bonuses for the use of their boats and nets. The Society would, in due course provide its own boats and nets on hire to any *babardar*. A small bonus is also paid to each worker according to the merits of his work. Out of the profits the Society sets apart a good sum to arrange for medical help for members, to provide convenient sheds, etc., for drying, storing or otherwise preserving fish in far away places and to create a fund for provision to members against sickness, old age, etc.

#### (5) COST OF ASSEMBLING.

Most of the fishermen and petty dealers who handle small quantities of fish, do not incur any assembling charges, as they themselves take the fish on head-loads, cycles or *bahangis* to the market. The wholesale merchants on the other hand, handle large quantities and the items of charges are (a) the cost of transport from landing centre to the merchants' premises, (b) the cost of preparation of the fish for the market and (c) the incidental charges incurred on packing and despatching fish—either fresh or preserved—to the consuming market. These charges vary from place to place. Wholesale merchants in producing areas usually have labourers on monthly wages who do all the miscellaneous items of work and it is difficult to assess the cost of assembling separately. The incidental charges incurred in the marketing of fish are discussed in detail under "Merchandising charges". (See page 71.)

Due to lack of proper landing facilities, losses in assembling are fairly heavy. After the boats touch the shore considerable distances have often to be traversed with the catch exposed to the hot sun before the fish could be collected in any convenient place. This is either the vast area of sand or the soft wet mud on the banks of a river, over which progress is very slow. (See upper plates facing pages 11 and 67). Good landing facilities are not available even in cities like Bombay, Karachi, Calcutta or Madras. Most of the fishing centres are not connected by good roads to the neighbouring villages or despatching stations. More wide-spread use of ice will result in smaller losses while assembling.

The losses during transit depend also on the season of the year and the method of transport. In summer months losses are high. When fish is sent packed with ice to terminal markets, losses occur due to (a) insufficient quantity of ice and (b) crushing of the fish on account of non-rigid packages being piled one above another. In the case of "live" fish which are brought in boats to consuming centres and where often a month elapses between the catching and the sale, the fish lose weight on account of starvation.

Losses in the assembling of cured fish are negligible.

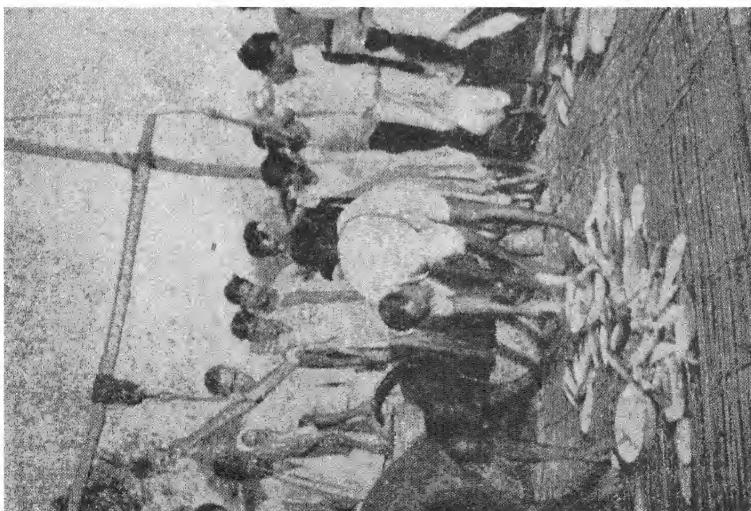
#### D.—Fish markets.

At some stage or other all fish (fresh or preserved) except those for own consumption, pass through markets—either daily or weekly or in larger cities.

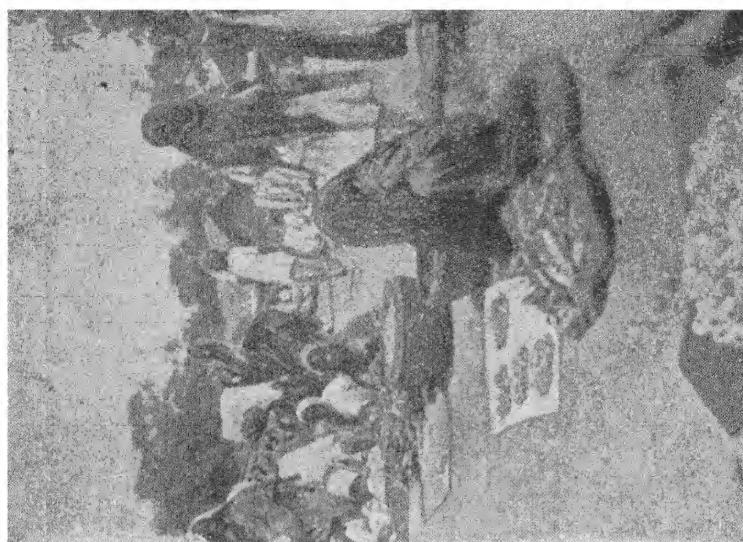
\*In the Indian Fisheries Act (Act IV of 1897), "private water" has been defined as "the exclusive property of any person, or in which any person has for the time being an exclusive right of fishery whether as owner, lessee or in any other capacity".



FISH AUCTIONED AT THE CRAWFORD MARKET, BOMBAY.



SORTING AND WEIGHING THE CATCH AT A PRODUCERS'  
CO-OPERATIVE SOCIETY IN BENGAL.



A DRY FISH STALL IN A WEEKLY *shanty*.



A FRESH FISH STALL IN A MUNICIPAL MARKET.

## (1) RURAL MARKETS.

In almost all villages which are situated near a fishing centre, there are open spaces which serve as fish markets. Some producers and village merchants assemble their produce there and consumers or retailers buy the fish. Prices are settled only after a good deal of haggling.

In the weekly kars or shandys, a place is usually allotted for the sale of fish. Generally cured or dried fish is sold in periodical markets. In inland areas where the source of supply of fish is tanks fishermen catch more fish on shandy days and bring fresh fish also for sale in the markets. These markets serve an area within a radius of 10-15 miles. Purchasers are usually the retailers in the surrounding areas. In the Madras Province, very large quantities of cured and dried fish are assembled and sold in weekly shandys. (See upper plate facing this page.)

The rural markets are owned by District Boards or zamindars. A market fee is generally charged from all people who assemble there for the sale of their goods. The right of collecting the market fee is generally given on contract on an annual basis, but the contractor can charge only according to a schedule of rates fixed by the owner. Fees are levied per seller or are based on the approximate quantity transported per basket, hand-cart, or bullock cart. The rates vary from 3 pies to one anna per maund in the different markets.

## (2) URBAN MARKETS.

Urban markets (called mandis in certain areas) are wholesale daily markets usually situated in the district headquarters, important trade centres or near railway stations. Both assembling and distribution of fresh fish take place in these markets.

The markets vary considerably in size and lay-out. In Bombay a special section allotted in the Crawford Market serves as the secondary market, while in Delhi, Lahore, etc., the transactions take place in adatya's shop. The fish section of the Crawford Market is a large block, with expanded metal screens instead of solid walls, allowing plenty of light and air and raised platforms which can be flushed with water after the day's business is over. (See upper plate facing page 64.) A large number of commission agents operate in this market. Several auctions take place simultaneously, each commission agent selling fish consigned to him by wholesale merchants in the producing areas. At adatya's shops also the mode of sale is through auction, the buyers making open bids. A typical auction scene in an adatya's mandi is described below to show the market functionaries, charges, etc.

The auctioneer is the adatya into whose shop all fish have to be assembled. The shop is ordinary and commonplace, built in the form of an open shed. Sometimes it is only an open yard. A brick or cement flooring is provided and on one side there is a raised platform on which the adatya, his munim (accountant) and some distinguished dealers and buyers sit. A tub of water is provided in one corner for washing fish. As consignments arrive, the parcels are opened by the adatya's servants who sort the fish according to varieties and in some cases according to size also. The fish are then arranged in lots known as chabbas and these are made as nearly equal in weight, quality and value as possible. Buyers squat or stand around the fish assembled for offering their bids. The adatya starts the auction by himself offering a bid which he deems is reasonable and goes on increasing it according to the bids (which are generally indicated by certain signs, un-intelligible to the layman but well understood by the parties concerned) till he closes the auction at a certain price. Immediately a lot is removed, another chappa is put up for auction. The auction trends are noted by the munim in his books. After the day's business—generally the mandi opens at 8 A.M. and closes for the day by noon—the accountant prepares a statement for each dealer or assembler showing the amount accruing to the seller. The prices at which the different lots belonging to a seller were auctioned are shown. From this are deducted all the charges paid by the adatya, e.g., transport costs and incidental charges if any incurred and (a) his own commission which varies from 6 pies to 2 annas per rupee on the gross value of the fish sold and (b) value in cash of certain customary deductions in kind (karan)\* payable by the assemblers to the adatya and his servants. In certain mandis, deductions are made in kind and the adatya auctions the "karan fish" at the close of the day's business. The adatya pays the seller cash immediately after the sale but usually allows the buyers credit for two or three days. If the seller has received any advance from the adatya the net sale proceeds due to him or a part thereof is adjusted towards the loan. It may be mentioned that the adatya usually gives interest-free loans to assemblers to induce them to bring fish to his mandi. When the seller is not present in person, but has sent fish to the adatya on "commission basis" the net sale proceeds are remitted to him by post.

\*The adatya, his munim, the servants who place lots for auctions claim a large fish each, while the sweeper and the thobi who cleans gunny bags in which fish consignments arrive get slightly smaller specimens. Besides this, a large fish is also taken from the total quantity belonging to an assembler in view of the expense the adatya incurs to feed him.

## (3) ORGANISATION AND CONTROL OF FISH MARKETS.

The time of holding the fish market varies in different places. In rural areas, transactions take place when supplies expected from various sources have been assembled. In towns and cities fish markets are held early in the morning or both in the morning and the evening. In the latter case, the turnover is more during the morning session.

Except markets in cities, municipalities and cantonments, other wholesale fish markets are not held subject to the supervision or control of any public or government organization. The executive authorities of municipalities and cantonments are empowered, under the various legislative measures to control the sales of food and drinks, to inspect the quality of fish exposed for sale within their limits and destroy any unwholesome fish. Within municipal or cantonment markets, stall holders who retail fish cannot sell at rates higher than those fixed by the market authorities. These markets are kept in a sanitary condition by the market authorities (see lower plate facing page 65). In other wholesale markets each *adatya* works independently; he, however, observes the established conventions regarding the rates of commission and other dues and provides certain amenities to his customers.

No direct transaction between sellers (when they are present) and buyers are allowed in *adatya's* shops.

## E.—Storage.

Fish and fish products are highly perishable; attempts are, therefore, made to dispose of stocks as quickly as possible even at a smaller margin of profit. In spite of this, some storage becomes inevitable during their movement from one agency to another, before they reach consumers.

Fresh fish is not stored in any consuming centre for more than 24 hours. Even for storage for this period the fish has to be packed with broken ice or kept in a chilled room of a cold storage as in Bombay (see page 31 of this Report). The quantity of frozen fish stored for long periods is negligible.

Storage is possible and necessary in the case of cured fish and fish products. The period of storage differs in different areas and depends upon factors such as type of the product, nature and efficiency of its cure or preservation, the season and the trade demand. Oily varieties, wet-salted and light-cured fish are disposed of quickly. Hard dried fish can be and are sometimes stored up to six months. Fish manure and guano are very soon sold.

Fishermen do not store preserved fish. They are in need of cash and immediately the fish are sufficiently dry, they are sold to a wholesale merchant in the producing area. During preparation they keep the fish in gunnies, baskets or in heaps. Curers and wholesale merchants store preserved fish in heaps in a corner of their houses, or in special sheds erected for the purpose. In Chittagong dried fish are stored in *golas*. (See lower plate facing this page.) On a raised brick platform about 2 feet from the ground, a conical structure 6 to 8 feet in height is erected using split bamboo and double mats. When filled with fish the *gola* is covered carefully with more mats to exclude damp air. In Tipperah, the pit system of storage is adopted. In this system a cavity 4 to 5 feet deep is excavated and lined with mats made of split bamboo pieces. After stocking the fish more mats are placed on the top and the cavity is covered with earth. In the weekly *shandy* in South India cured fish received from producing areas in bundles are stored as such till the *shandy* day (see upper plate facing this page) when they are opened and exposed for sale. In certain secondary markets such as at Arkonam and Sewri rented godowns are used by merchants to store fish. The godown at Arkonam belongs to the South Indian Railway while those at Sewri are owned by the Bombay Municipality. The godowns at Sewri consist of over 50 rooms each measuring 20 x 10 feet. They are permanent structures and are maintained in good condition. The monthly rent is Rs. 10 for each room. Attached to each godown is a yard used for unpacking, cleaning and drying fish that are received and packing the same for despatch.

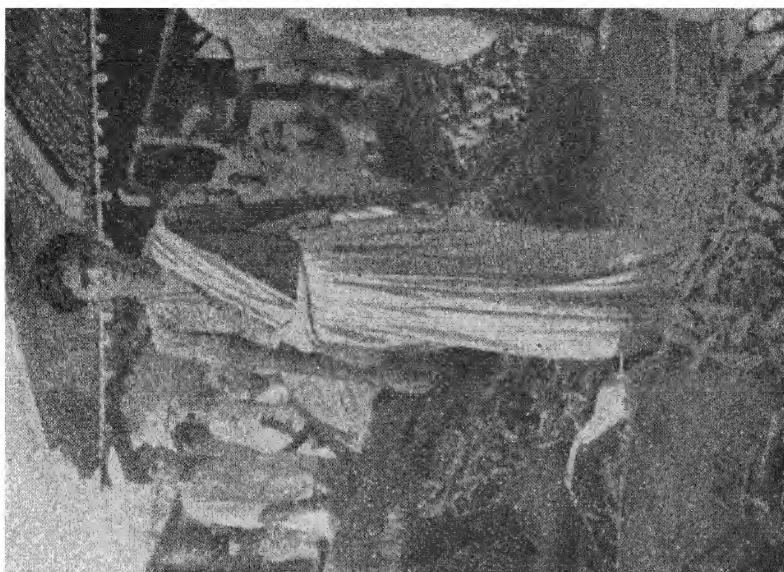
In the case of preserved fish 2-3 weeks is the carry-over period during which it reaches the consumer. Bulk of the stock is visible during October to March, but this is not carried over beyond April in most of the areas. Stocks are almost negligible during the monsoon months, except in Bengal, where dried fish are consumed during rains and special storage methods are adopted to prevent deterioration due to moisture.

Fish oil is usually stored in kerosene tins, or in large drums which when full are sold along with the containers.

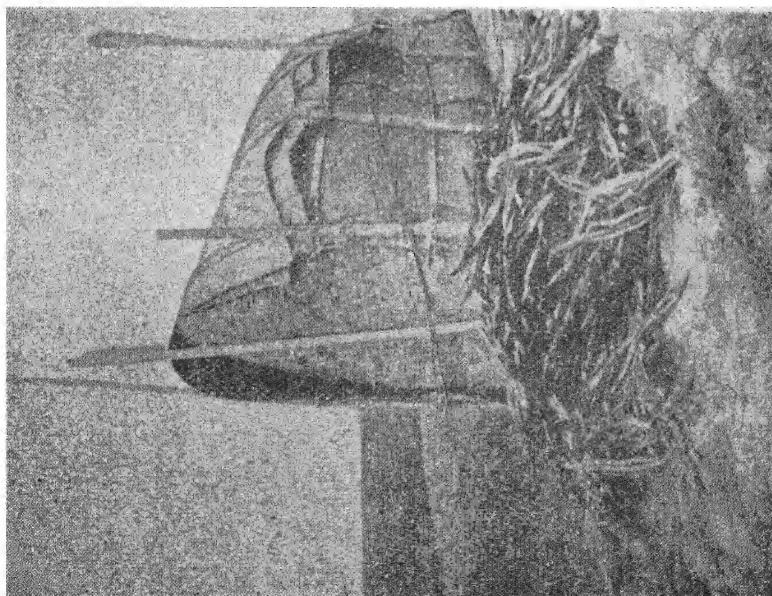
Preserved fish are liable to insect and bacterial attack. Losses in storage due to these reasons are estimated at about 1 per cent. If pronounced deterioration has taken place merchants sell such fish only as manure at very low rates.

## F.—Transportation.

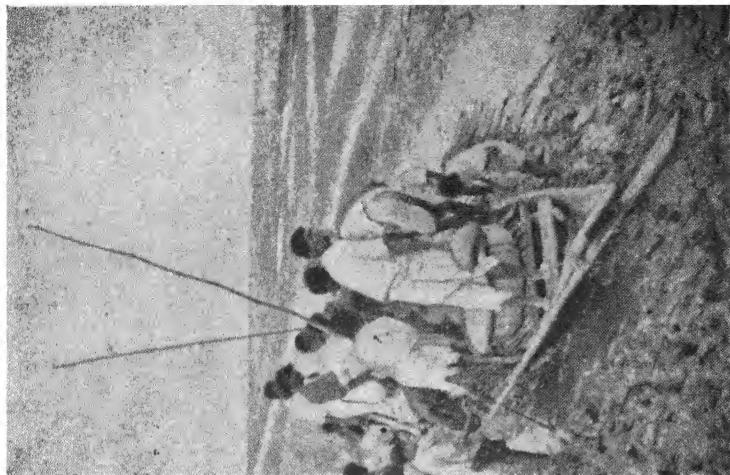
All means of transport commonly employed for carrying other agricultural produce are used for transporting fish also. The chief forms are head-loads, *bahangis* (shoulder slings), bicycles, pack animals, pony carts, motor vehicles, railways, boats, steamers as well as bullock carts. The use of a particular means of transport depends upon the distance to be travelled, the quantity of fish,



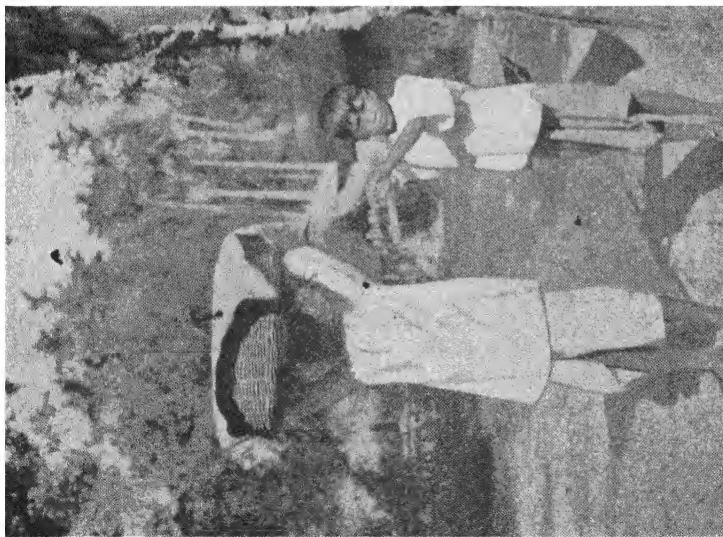
WHOLESALE MARKET FOR ASSEMBLING AND STORAGE  
OF DRIED FISH.



STORAGE OF DRIED FISH IN GOLAS IN BENGAL.



TRANSPORT OF FRESH FISH IN FAST ROWING BOATS  
IN THE INTERIOR OF BENGAL.



TRANSPORT OF FISH BY HEAD LOADS.

facilities available for quick and safe despatch and the expenses that have to be incurred. In view of the scattered production of fish the extent to which each mode of transport is utilized varies according to local conditions and may change from day to day. This and the uncertainty regarding the total catch that may be landed make the problem of transport all the more difficult for the agencies concerned in the assembling and despatch of supplies.

#### (1) TRANSPORT BY ROAD.

The transport of fish by head-loads is common in all producing areas. Fishermen or their relations carry fish in baskets (see lower plate facing this page) to the wholesaler's premises, village markets or when hawking from house to house. When a larger quantity, *viz.*, 2 maunds has to be transported five miles and over, *bahangis* are generally used. (See upper plate facing page 68.) As the producers or the petty dealers invariably carry the fish themselves, no extra cost is incurred for the transport of fish by head-loads or shoulder slings. Conveying fish on bicycles is becoming more and more popular. They are fast, can be used on foot-paths and can be taken directly to places where fish is landed. Usually about 2 maunds of fish are carried on a cycle. (See lower plate facing page 63.) The distance covered is usually 10 miles but sometimes even 30 miles are covered in relays by three persons. Cycles are supplied by merchants who may obtain them on hire. The cost of transport by cycles works to 2.5 pies\* per maund per mile. Transport by head-loads, slings and bicycles is confined to fresh fish.

Pack animals such as ponies and donkeys are employed to transport fresh waterfish in Kashmir State, the North-West Frontier Province, the Punjab, the United Provinces, the Central Provinces and Berar and H.E.H. the Nizam's Dominions. Camels are sometimes used in Sind. These animals are owned by members of the fishing party which goes to fish in inaccessible places in rivers, etc. This mode of transport is employed only over short distances not exceeding 15 miles; if the market is far away the fish is transferred to pony carts, motor lorries or sent by rail from the nearest point where faster transport is available.

Pony carts are generally used in the urban areas. (See upper plate facing page 69.) They are used to transport fish from the wholesale to the different retail markets in all towns and cities. But where good roads exist, these are also employed to bring fish from producing centres which may be 15—20 miles distant from the urban markets. They can carry up to 6 maunds and the producer or the merchant also takes his seat in the cart while carrying his supplies to the market. From Ponneri, Pulicat and other places fresh fish are brought in pony carts to Madras. The cost of transport ranges between 6 pies to 9 pies\* per maund per mile.

Motor lorries are utilized, as a rule, for quick despatch over distances of 100 miles and over. They are advantageously employed when a whole lorry can be loaded with dry fish as for example from west coast fishing centres to Coorg, Mysore, Coimbatore, etc. In most parts of the country, as passengers generally object to sit in buses which carry a basket or two of fish as freight, the movement of small lots of fresh fish by this means to town markets is practically negligible. If 8 to 10 maunds of fresh fish could be assembled and the distance to be transported is 40—50 miles small motor cars are generally pressed into service, *e.g.*, from Tada, Arambakam and Sulurpetta, etc., to Madras city.

There is no fixity in regard to the rates charged for the transport of a full lorry load of fish. The charges vary from tract to tract depending upon local conditions and competition from alternative means of transport. They vary from 0.5 pie to 2.5 pies\* per maund per mile. For longer distances and full loads the rates are cheaper than for shorter distances and smaller loads.

Bullock carts are used only for transporting heavy bundles of cured or dried fish. They are slow but 20—25 maunds can be carried at a time. They are employed to haul parcels to railway despatching centres or from railway stations to markets. (See lower plate facing page 69.) In South India, preserved fish are carried in bullock carts from producing areas to assembling markets which may be 50 to 60 miles distant. Here also the charges work out lower when full cart-loads are transported over long distances.

#### (2) TRANSPORT BY WATER.

Except in a few areas, transport of fish (especially fresh fish) by water, is confined to the carriage of fish by boats from the point of fishing to the nearest points where a better means of transport is available for its conveyance to the assembling or consuming markets. This is common

\*These estimates relate to the year 1940.

only in river fishing and as fishermen themselves either row or tow the boat to the appointed ~~coastal~~ heads, no extra expenses are incurred by assembling merchants on this score. In the Sunderbans in Bengal, however, boats are the only means of transport and fish has often to be carried several miles till rail or steamer heads such as Khulna, Canning, Diamond Harbour, Bakerganj, etc., could be reached. *Nikaris* usually go about in boats and purchase fish from owners of fishing wiers at Goalundo (Bengal). As ordinary boats are slow-moving special boats fitted with a number of paddles are employed for this purpose. (See upper plate facing page 67.) In such cases the cost of transport which works to 2 pies\* per maund per mile is borne by the assembling merchants.

The use of motor boats to bring fish to Bombay and Calcutta has already been mentioned. Those plying in the Arabian Sea bring fish from places which are 21 to 400 miles from Bombay, and the average cost of transporting 1 maund of fish from Canara coast to Bombay (approximately 250 miles) works to Re. 2-3-0\*.

Boats are used for transporting cured or dried fish in river districts of Bengal, Surma valley in Assam (see lower plate facing page 10) in the coastal districts eastern of Madras and in the backwater areas of Cochin and Travancore. These boats have usually a carrying capacity of 15 maunds. Boat transport is cheapest; at the same time it is the slowest. In a navigable river or a deep canal, the rate of travel is faster than when the boat has to be towed with ropes from the banks. The average cost of transport works to less than half pie\* per maund per mile.

River steamers which ply in the navigable rivers of Bengal, Bihar and Assam carry fresh fish. The freight charges are fixed according to the distance and concessions such as carriage at three-fourth the usual parcel rates, facilities for returning empty containers and special rates between particular points are allowed by the steamer companies. The coastal service steamers sometimes bring fish from Karachi to Bombay.

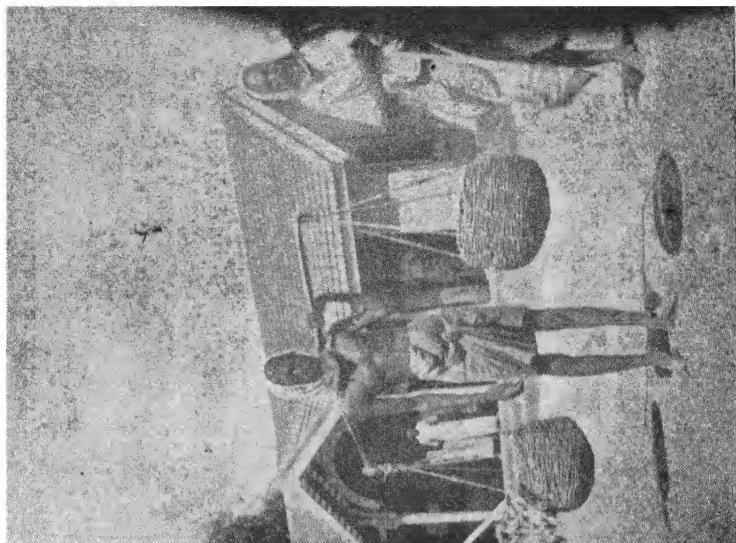
Fish products from Arabia are brought to ports on the West Coast of India in sailing vessels. A major portion of the export trade between India and Ceylon is also handled by sailing schooners.

### (3) TRANSPORT BY RAIL.

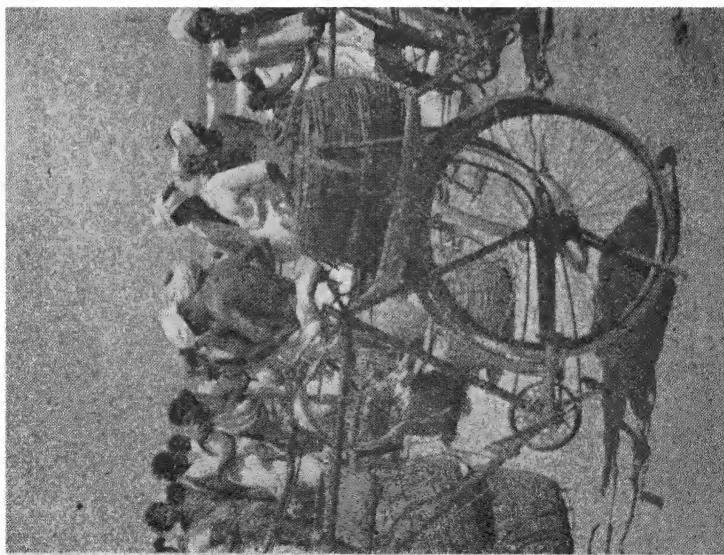
This is the most important means of transport employed for carrying fish over long distances. Fresh fish is accepted for transmission by mail and fast passenger trains. Dried and salted fish are also booked for transport by passenger trains. In most parts of the country dried and salted fish are, however, carried by goods trains.

There is a general tariff of rates for carrying luggage and parcels by passenger or mail trains based upon distances and weights. These rates are fixed by the Indian Railway Conference Association and with the approval of the Railway Board are generally applicable to all the railways in India. Fish are charged at half parcel rates on gross weight, i. e., fish plus ice plus container, at owner's risk and pre-payment of the freight is compulsory. Consignments of fish are brought on head-loads, *bahangis* and in carts to the railway station by merchants' coolies. Being a perishable commodity, booking and delivery are open on all days of the week. The railways require that the parcels should be packed in durable containers, properly tied and labelled. If, however, risk note form 'A' is executed (which absolves the railways of all responsibility or loss, damage, etc., to the consignment arising out of defective packing) insecurely packed parcels are also accepted. The handling of fish parcels between the parcels office and the train both at the despatching and receiving stations is part of the service performed by the railways. The merchants, however, assist the railway staff to load the parcels in view of the short halt in many of the consigning stations. During transit the consignments are placed in the brake vans of the mail or passenger trains. In most cases the parcels are piled one over another. On reaching the destination, the fish parcels have to be removed from the station premises within 24 hours or even earlier if they are likely to become offensive. If they remain unclaimed beyond the above period the station authorities are empowered to auction them at the owner's risk and expense. The merchants, therefore, make it a point to call at the parcels office at appropriate times to clear away parcels they expect to have arrived. In many places the parcel staff often arrange to send the consignments to merchant's premises, should they fail to turn up. The way-bills are surrendered as soon as they are received by post. Empties, returned, are carried at half parcel rate provided (i) freight is pre-paid, (ii) the empties are returned within seven days of their receipt at destination, (iii) the particulars of the original booking are quoted on the forwarding note and (iv) the consignee and the consignor are the same as in the original consignment.

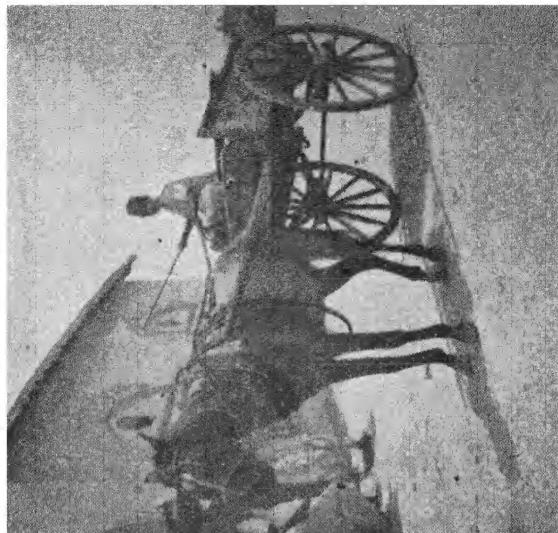
\*These estimates relate to the year 1940.



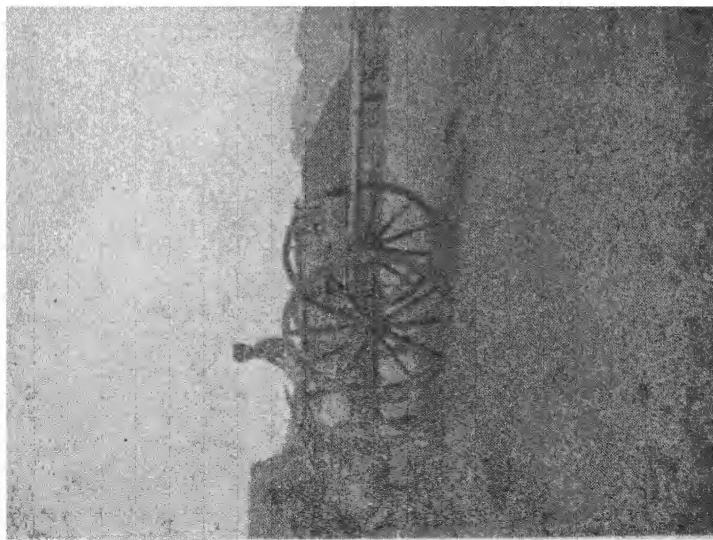
TRANSPORT OF FISH BY SHOULDER SLINGS.



BICYCLES USED FOR CARRYING FRESH FISH FROM THE  
REACH TO MARKETS.



TRANSPORT OF FISH IN PONY CARTS.



TRANSPORT OF FISH PARCELS BY BULLOCK CART TO THE  
RAILWAY STATION.

As a rule, only preserved fish are consigned by goods train. The general rules for the acceptance and carriage of fish by goods trains have also been drawn up by the Indian Railway Conference Association. Freight is chargeable at the following rates :—

*Freight charges for transport of fish by goods train.*

Commodity.	Class or schedule.	Rates (per maund per mile).	Conditions.
Fish, dried or salted.	2nd class	·42 pie	Railway risk ; loading and unloading must be performed by owners when in wagon loads.
Fish, dried or salted.	C/G schedule	·36 to ·10 pie according to distance.	This rate applies over the S. I. Railway only subject to the following conditions— (i) At owner's risk. (ii) The minimum weight for charge is 300 maunds per 4-wheeled broad gauge wagon and 200 maunds per 4-wheeled metre-gauge wagon. (iii) The rate applies to traffic carried for distances 51 miles and over. (iv) Loading and unloading is performed by owners.
Fresh fish.	4B class	·72 pie	Railway risk, pre-payment of freight compulsory.  Note.—Traffic in fresh fish is not accepted over the B. & A. Railway (A. B. Zone).
	4th class	·62 pie	Owner's risk, pre-payment of freight compulsory.
Fish in tins.	6th class	·83 pie	Railway risk.

Station to station rates have been provided on almost all railway systems for traffic between important markets. The freight charges vary between  $\frac{1}{2}$  to  $1/3$  the usual parcel rates ; in certain cases fixed rates from one station to another station which are cheaper than even quarter parcel rates are charged.

Special station to station freight rates for the transport of dried fish by goods train in wagon loads from Kasaragod, Mangalore and Tirur on the west coast to Tuticorin exists over the S. I. Railway these rates also apply in through booking to Colombo.

There are a few other special facilities provided by transport agencies. These comprise (i) laying down dimensions for standard containers, e. g., the B. A. Railway, the I. G. N. and Railway and the R. S. N. Company—Bengal, to obviate the necessity of weighing each parcel, (ii) carriage of ice at reduced station to station rates for use in packing fish and (iii) issue of third class monthly and quarterly Market Vendors Season Tickets to important urban consuming centres from stations up to 80 miles distant. The last facility is provided over the E. I. M. and S. M., S. I., B. & A., B. B. & C. I. and G. I. P. Railways. Over the M. & S. M. and S. I. Railways the holders of market vendors season tickets can carry without any additional charge (a) 50 seers of market produce such as fish, vegetables, fruit, etc., on the forward journey and pay for market produce in excess of 50 seers at one pie per maund per mile subject to a minimum charge of 2 annas and (b) 25 seers of luggage including ice up to 10 seers, and empties, etc., on the return journey. No market vendor is, however, allowed to carry more than 2 maunds of market produce at any one time at concessional rates. Over the E. I., B. B. & C. I. and G. I. P. Railways, the holders of market vendors season tickets are allowed to carry free of charge  $1\frac{1}{2}$  maunds and in the case of the B. & A. Railway 2 maunds of market produce the quantity in excess of the free allowance being charged for separately at the rates applicable thereto. Special market vendors' vans are attached to morning suburban trains arriving at Bombay and Calcutta.

Long distance fish traffic is not great on any railway system at present. Difficulties of getting a regular and economic load stand in the way of introducing refrigerated vans for fish traffic as in the case of fresh fruits. In this connection certain experiments conducted by the South Indian Railway in 1940 for carriage of fish from west coast stations to Madras in a Broad gauge insulated van may be

mentioned. The van which was constructed by the Railway Company at the instance of the provincial marketing organization had a carrying capacity of 9 tons. It was not pre-cooled or provided with bunkers filled with ice. The load consisted of fish parcels packed with ice: the van being insulated a rapid and continuous melting of ice was avoided. The aim was to reduce the quantity of ice per parcel and thus economise both cost and freight. The Railway Company carried the parcels at the rates applicable for transport by ordinary vans. The experiment had soon to be terminated due to lack of haulage.

Occasionally some private firms transport fish along with other cold stored provisions in their own refrigerated vans, but the traffic is negligible.

#### (4) TYPES OF CONTAINERS AND PACKING MATERIALS USED IN THE FISH TRADE.

The containers generally used in the fish trade are (a) nets, (b) baskets, (c) gunny bags, (d) wooden cases, (e) earthen pots or kerosene oil tins and (f) cocoanut, palmyrah and screw-pine leaf mats.

*Nets* are used chiefly in the producing areas for carrying small quantities of fish from boats (see upper plate facing page 21), etc., to the assembling centre or nearby markets. In certain areas large masses of fish are kept alive in water in bag-nets staked near the shore from which quantities are removed according to requirements.

*Baskets* are in universal use in the fish trade. These are generally made of bamboo strips, but their rigidity, size, shape and cost vary. Occasionally materials like *pilchi* twigs may also be used for basket making. For transporting fish from landing ghats to assembling centres large shallow bamboo baskets are used. In Malabar it is generally observed that a piece of the flattened leaf stalk of the areca-nut palm is stitched to the under-side of the basket to collect any water which might drain from the fish. Deep baskets are used for sending fish over large distances. When ice is not used, the system of packing is simple. Fish are placed in the basket and the open mouth covered with a piece of gunny cloth which is stitched to the edge of the basket. Market vendors only place some green leaves over the fish when they accompany the consignment. For long distance transport, especially during the summer months, fish is packed along with ice in baskets. These baskets are generally made of split bamboos closely plaited together. Lids of the same material are also provided. Fish and broken lumps of ice are placed in the alternate layers and when full, the lid is put on and firmly tied with coir or *munj* ropes. The baskets used to transport chilka fish to Calcutta are provided with two stout bamboo handles. The cost of baskets varies from 6 pices to as much as 10 annas each depending upon the capacity, type of construction and material. Strong baskets used in the iced fish trade are returned when empty to the producing centres and are reported to be serviceable for six journeys.

*Wooden cases* are used mostly by commission agents and wholesale merchants for despatching supplies in ice, by rail, to distant markets. (See lower plate facing this page.) Cases which have once been used for packing fruits, soaps, cutlery articles or tea are generally used for this purpose. The method of packing fish with ice is the same as in the case of bamboo baskets. The quantity of ice used depends upon (a) the season—a larger quantity is used in summer, (b) the type of fish, (c) the distance to be transported and (d) the time of sale of the fish. During transport over long distances involving transhipment, arrangements are often made in Bengal to add more ice at intermediate stations and the steamer companies and railways provide facilities for this. In the case of consignments that reach the consuming centre too late for immediate sale the consignor generally puts more ice in the parcel in advance so that it could be stored undisturbed till sale can be effected.

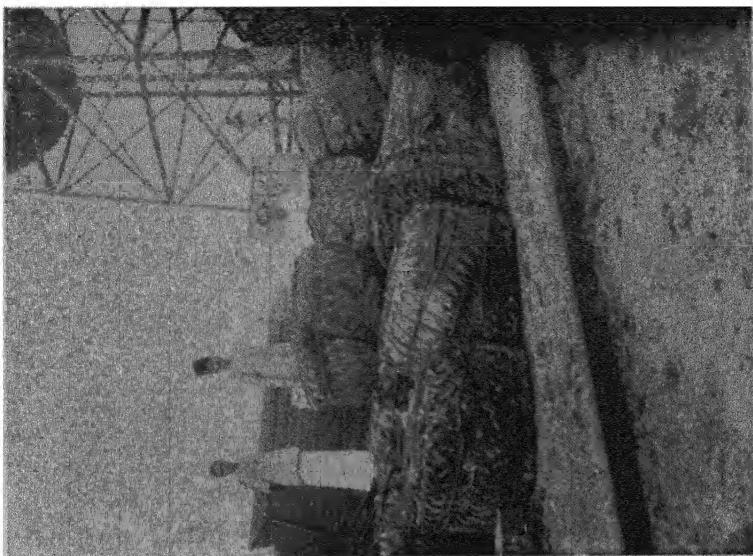
The use of "standard" containers in certain areas of Bengal has already been mentioned. The dimensions laid down are given below:—

33" x 24" x 21"	charged for 5 maunds gross weight.
30" x 24" x 18"	" 4 " "
27" x 21" x 18"	" 3½ " "

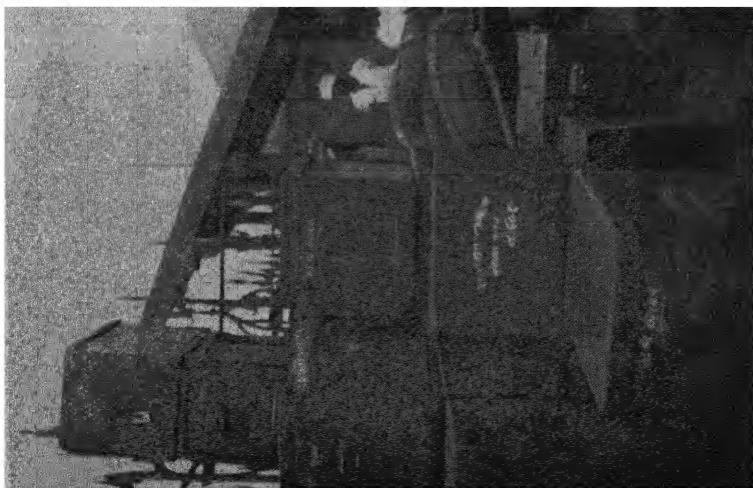
The empties are returned and are used repeatedly, after minor repairs if necessary, till they become unserviceable. Second-hand packing cases with a gross capacity of 1½ maunds (tare 5 seers), used to cost from 6 to 10 annas each. "Standard" boxes used in Bengal are considerably heavier being approximately 1/5th the gross weight of the filled containers.

Baskets are cleaner, lighter, and cheaper than boxes. Merchants and commission agents take into account the freight and durability when deciding upon the type of the container to be used. The empties, whether baskets or boxes are not washed or disinfected before a fresh lot of fish is packed into them. From the hygienic point of view a cheap non-returnable container would be the best.

*Gunny bags*.—The use of gunny bags is confined to the transport of large freshwater fishes from producing centres to nearby consuming markets. These are obtained second-hand from grain merchants. Fish is put in the bag and the open end is stitched with hessian thread. Being a non-rigid container, its disadvantages are obvious. Fish guano and manure are always packed in gunny bags.



SALTED COCONUT LEAVES  
PACKED IN THE  
PORT BY  
SALT MARKETS  
IN MA  
LAYSIA.



BOXES USED FOR TRANSPORT  
CRAWFORD MARKETS  
NIGERIA.



**SALTED FISH PACKED IN SCREW PINE LEAF MATS FOR EXPORT TO CEYLON.**

**Earthen pots and kerosene tins.**—These are used in the transport of "live" fishes. Kerosene tins are preferred when these have to be sent by rail. The earthen pot or tin is more than half filled with water, the fish is put in and the opening secured with a piece of net or some other open-meshed material. During summer more water is put in than in winter. Freight is charged on actual weight, i. e., fish *plus* container *plus* water.

Kerosene tins are universally used as containers for fish oil.

**Cocoanut, palmyrah and screw-pine leaf mats.**—These are used for packing dried fish. Plaited cocoanut leaves are very cheap, but are lacking in strength (See upper plate facing page 70.) They are, therefore, used only when the distance to be transported is small and there is no transhipment or likelihood of rough handling. Screw-pine mats are stronger and all salted and dried fish sent to Ceylon from the west coast are packed in screw-pine mats. (See plate facing this page.) While plaited cocoanut leaves (45" x 18") cost Re. 0.12-0 per hundred, Palmyrah mats (30" x 15") cost Rs. 1.4-0 and screw-pine mats (60" x 42") Rs. 4 to 6 per hundred. The packages are of various sizes and shapes. The preserved fish is firmly rolled in mats and secured with coir ropes. Fish does not remain for more than 2 weeks in such bundles and its quality is not seriously impaired. The cost of packing varies from Re. 0.4-0 to 0.7-0 per bundle. The bundles, however, go out of shape owing to the piling up, one over the other in wagons.

#### G.—Merchandising charges.

##### (1) IN RURAL MARKETS.

The fishermen incur very little by way of market charges. When they take fish to a village market or a weekly *shandy* they are required to pay 3 pies to one anna to the market lessee. In many markets in South India a separate scale of charges is fixed for cured or dried fish. The market charge for fresh fish is fixed per vendor, whereas that for cured fish is computed on a weight basis. This varies from 6 pies per maund to 4 annas per cart-load. Besides the above charge, no other expenditure is incurred by producers. Buyers have not to spend anything in rural markets.

##### (2) IN LARGE ASSEMBLING AND DISTRIBUTING MARKETS.

The merchandising charges which a seller has to pay at terminal markets amount to approximately 25 per cent. of the value of the produce.

The merchandising charges may be classified into (a) charges incurred by rural dealers in consigning fish to the commission agents, (b) charges of the commission agents recovered from sellers for taking delivery of the goods and selling them off.

(a) *Charges incurred by country dealers in consigning goods to commission agents.*—These vary from place to place according to the type of the commodity, local conditions, means of communication, etc. The usual ranges are indicated in the following table:—

*Charges incurred in despatching one maund of fish to other markets.*

Items.	Fresh fish from Bombay to Sholapur.	Fresh fish from Tanur to Madras.	Salted fish from Tirur to Colombo.	Dried fish from Sewri to Hubli.	Fresh fish from Pattan Hotiana (Montgomery) to Lahore.	Fresh fish from Howrah to Delhi.
	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.
1. Cost of container (basket, bag or box).	0 4 6	0 5 0	0 2 9	0 6 0	0 6 0	0 5 0
2. Ice . . .	0 4 0	0 12 6	—	—	—	0 7 0
3. Packing material (coir rope).	0 1 0	0 1 0	0 1 6	0 2 6	0 2 0	0 8 3
4. Packing charges .	0 1 0	0 1 0	0 2 3		0 7 6*	0 3 0
5. Transport to railway station.	0 3 0	0 1 6	0 0 6	0 1 9	0 2 0	0 2 0
6. Station expenses .	0 1 3	0 2 0	0 1 0	0 0 6	0 2 0	0 2 0
<b>Total .</b>	<b>0 14 9</b>	<b>1 7 0</b>	<b>0 8 0</b>	<b>0 10 9</b>	<b>1 1 6</b>	<b>1 9 3</b>

\* Was transported 15 miles on camel back.

(b) *Charges of Commission agents recovered from sellers for clearing the consignments and selling them off.*—

These comprise the following items:—

(i) clearance and cartage charges, (ii) octroi, terminal tax, etc., (iii) commission, (iv) charity and (v) miscellaneous charges.

(i) *Clearance and cartage charges.*—These are incurred by commission agents in distributing markets on behalf of their clients for taking delivery of the parcels and transporting them to the markets or mandis. Generally a sum up to 1 anna per parcel is paid to the railway personnel for the unofficial services they render. The transport charges amount from 1 anna to 3 annas per mandi. Dried fish parcels are carried in bullock carts and the expenses incurred on this score are smaller.

(ii) *Octroi, etc.*—In most places in Northern India, a municipal toll, terminal tax or octroi duty is levied on goods arriving within the limits of the municipalities, cantonments and notified areas. The rates charged for fish vary from place to place and their range of variation is between 2 and 4 annas. The Simla Municipality, however, charges Rs. 1-8-0 which is the highest rate charged in India. In the Bombay Province, terminal tax is charged only on arrivals of dried fish.

In the Madras province, local Boards are empowered to levy a fee not exceeding Rs. 5 per annum in respect of public fish-curing yards used for storing or curing fish and one rupee in respect of any private store-house used for storing and trading in fish and fish products.

(iii) *Commission.*—This is the main item of expenditure and varies from 6-25 to 10 per cent. of the gross sale-proceeds. The merchants in Madras city pay a fixed commission of 8 annas per parcel of iced fish irrespective of the value realised on auction. For cured fish the rate of commission is 6-25 per cent. at Mannargudi, 7-5 per cent. at Palghat and 10 per cent. at Orathanad, Paramakkudi and Colombo.

(iv) *Charity.*—Under this item a charge is levied which is said to be used for maintenance of religious institutions, etc. This deduction is generally made only on sales of cured fish and is calculated at 2 pies per bundle.

(v) *Miscellaneous charges.*—These comprise the godown rent, sales tax, "karan" dues, Hicabana, postage and a commission of 8 annas per 100 rupees for "changing notes and rupees". The first four are usually levied on an *ad valorem* basis.

The following two examples illustrate the expenses that are generally incurred:—

*Example 1.*—Charges incurred on one basket of prawns, weight of prawns 18½ seers, value Rs. 10-10-0, sent packed with ice from Howrah to Delhi.

													Percentage Rs. A. B. to total charges		
1. Packing material and basket	.	.	.	.	.	.	.	.	.	.	0	7	3	5·6	
2. Packing and cart hire	.	.	.	.	.	.	.	.	.	.	0	6	0	4·6	
3. Ice (25 seers)	.	.	.	.	.	.	.	.	.	.	0	7	0	5·4	
4. Babu and cooly	.	.	.	.	.	.	.	.	.	.	0	5	0	3·9	
5. Commission on Rs. 10-10-0 at 10 per cent.	.	.	.	.	.	.	.	.	.	.	0	10	9	8·3	
6. Railway freight on 45 seers	.	.	.	.	.	.	.	.	.	.	5	4	0	65·1	
7. Hicabana	.	.	.	.	.	.	.	.	.	.	0	1	0	0·8	
8. Postage	.	.	.	.	.	.	.	.	.	.	0	1	6	0·8	
9. Terminal tax at Delhi	.	.	.	.	.	.	.	.	.	.	0	2	0	1·6	
10. Station charges and transport at Delhi	.	.	.	.	.	.	.	.	.	.	0	5	0	3·9	
Total												8	1	6	(100)

OR

75·9 per cent. of the value at Calcutta.

*Example 2.*—Charges incurred in sending 13 maunds of cured horse mackerels, valued at Rs. 32-8-0 from Poothurai (Travancore) to Paramakkudi: sold for Rs. 48-12-0 at the Paramakkudi whole-sale market.

													Percentage to total charges	
													Re. A. B.	
<i>At Poothurai.</i>														
1. Packing materials	.	.	.	.	.	.	.	.	.	.	1	6	6	8·4
2. Packing and cart hire	.	.	.	.	.	.	.	.	.	.	0	14	6	5·4
3. Cooly	.	.	.	.	.	.	.	.	.	.	0	6	6	2·4
4. Station charges	.	.	.	.	.	.	.	.	.	.	0	9	2	3·4

At Paramakkudi.	to total charges.
	Rs. A. P.
5. Commission for changing note and rupees . . . . .	0 4 6 1·5
6. <i>Malma</i> . . . . .	0 2 0 0·8
7. Cart hire . . . . .	0 13 0 4·8
8. Godown rent . . . . .	0 6 8 2·4
9. Postage . . . . .	0 1 6 0·5
10. Commission . . . . .	3 4 0 10·4
11. Clerkage . . . . .	0 3 0 0·8
12. Sales tax . . . . .	0 4 0 1·5
13. Railway freight . . . . .	8 3 0 48·7
 Total . . . . .	 (100)

or

51·7 per cent. of the value at Poothurai.

#### H.—Distribution.

Consumers receive their supplies of fish through one or other of the following agencies :—

- (a) Fisher-folk.
- (b) Village merchants.
- (c) Curers, commission agents and whole-sale merchants.
- (d) Co-operative societies.
- (e) Retailers.

(a) *Fisher-folk*.—The producers, i. e., relations of the fishermen take part in the distribution of fresh fish by hawking in the nearby villages or towns, or by selling them in an improvised shop in a central locality in the village or town. They get better prices in towns where there is a good demand for fish.

(b) *Village merchants*.—The village merchants distribute fresh fish in much the same way as producers, disposing them to retailers in villages and to curers and wholesale merchants in assembling markets.

(c) *Curers, commission agents and wholesale merchants*.—These differ from producers and petty dealers in having proper premises for their business and in handling larger quantities of fish. A popular method of distribution practised by these merchants is to send consignments on commission account to *adatya*s in consuming markets, who are authorised to sell the fish according to instructions given from time to time. For such consignments the owner has to bear all expenses. In large centres like Calcutta, Bombay, Madras, Karachi, etc., the distribution actually commences at the railway platform or just outside the railway station where wholesalers and retailers meet every morning. After settling prices often by an auction the retailers take away the consignments directly from the platform.

(d) *Cooperative societies*.—The part played by Fishermen's Co-operative Societies in the assembling and distribution of fish is insignificant. A reference has already been made to the mode of operation of a few typical societies.

(e) *Retailers*.—In towns and cities retail sales are made from the shops of wholesale distributors and retail merchants. These shops generally also sell poultry and eggs. The shops may be either in a street or within a municipal market and are visited by consumers direct. In municipal towns there is usually a municipal market in which a separate section or a few stalls are set apart for fish. The stall rents vary according to the size as well as the location of stall in the market. The retailers have to abide by the regulations of the municipality regarding the wholesomeness of the fish sold.

In most municipalities, cantonments and notified areas, hawkers and retail shopkeepers of fish are licensed. The license fee varies from Re. 1 to Rs. 2·8 per half year.

In Bengal, Orissa, Madras, and Bombay provinces women carry on the retail sale in the shops. A kind of bent knife, fixed in a wooden board, a few baskets and a mud-pot containing water constitute the usual paraphernalia in a shop. Where fish is sold by weight a pair of scales and the usual set of weights would also be seen. Two small deep baskets serve as pans for the balance. After sale, the seller would remove the fins and scales and cut the fish into pieces should the customer so desire. This service is done free. The cut pieces are wrapped in a paper and carried home. In the case of small varieties, the usual procedure is to pass a string through the gill openings and carry the fish home dangling on the string.

### I.—Total charges incurred in the marketing of fish and price spreads from producer to consumer.

The methods by which consumers get their supplies of fish have already been discussed. Price spreads for five typical instances in the marketing of fish are given in Appendix XIX. In the first instance the producer within a few miles of a consuming market (Cannanore) brings his catch to the assembling centre where it is bought by a petty merchant. The fish is sold by the latter direct to consumers by hawking and the producer's share in the consumer's price is relatively high amounting to 74.2 per cent. In the second instance, the fish is brought to a wholesaler in the producing area who gets it cured and then despatches it to a commission agent at Orthanad for disposal. Thence the fish passes through a village market and ultimately to the consumer. The producer's share in the consumer's price is only 43.7 per cent. In the third instance, fresh beckti is despatched in ice to the Sealdah wholesale market from whence a commission agent purchases and re-exports it to Delhi. The merchant at Delhi retails the fish in his shop in a municipal market. The producer's share is only 30.2 per cent. of what the Delhi consumer pays. In the fourth instance, the fish is cured in a fish-curing yard in the North Canara district of the Bombay Province, moves by country craft to Sewri, and then by rail to Hubli. It is consumed in the surrounding villages of Hubli. Here the producer's share works to 46.1 per cent. of the consumer's price. In the last instance, fish caught at Pattan Hotiana, in Montgomery district, Punjab, packed without ice in gunny bags, was transported on camel back for 15 miles and then by lorry direct to the *adalya's mandi* at Lahore. It was sold by auction and ultimately reached the consumers through hawkers. Here the producer gets 47.5 per cent. and the retailer 27.4 per cent. of the consumer's price.

It will thus be observed that the producer's share in the different instances varies from 30.2 to 74.2 per cent. of the consumer's retail price. The producer's share in the consumer's price is highest when the fish is sold in the producing area and lowest when it is sold retail at distant markets. The consumer's price at distant markets are, of course, higher than in the producing areas.

### J.—Finance of the fish trade.

Of the different agencies engaged in the organized assembling and distributive trade of fish, the wholesale merchant at the producing areas and the commission agent in the consuming markets constitute the chief financing agencies. Their earnings depend upon the extent to which they can attract regular supplies from the various sources and arrange for their remunerative and speedy disposal. They generally adopt the following procedure to meet this end:—

(i) Advance varying sums of money to fishermen and petty dealers in lieu of a prior claim on the catch; (ii) give their boats and fishing nets to fishermen for a share in the catch; (iii) help fishermen with provisions or with materials for net making, e. g., cotton, hemp, etc.; (iv) employ their agents to visit the various producing centres to buy the catch from fishermen and (v) encourage small scale retailers and hawkers to distribute the fish. Although fish merchants do not generally advance money to small-scale retailers and hawkers, they provide them with sufficient quantities of fish for retail distribution and realize the cost of fish at wholesale rates applicable after the fish has been sold.

Wholesalers and commission agents have also to meet the cost of packing material, salt, curing expenses, and pay railway freight, etc. To meet all these, they require finance. Generally they have their own capital. Sometimes, they borrow from local *Sahukars*. These loans are advanced to them only against some substantial security and not against their assets connected with the actual fish trade.

At present banks do not give loans to fisherman or fish merchants except when material unencumbered assets like jewels, property, etc., are tendered as security. Co-operative societies at present, play only a minor part in the finance of fish marketing.

## CHAPTER VIII.—MISCELLANEOUS.

### A.—Activities of fisheries departments.

#### (1) HISTORICAL.

During sixties of the last century a number of dams and wiers were constructed in South Indian rivers. Sir Arthur Cotton who was in charge of these projects expressed a fear that the dams might adversely affect the local coastal and inland fisheries. On his representation the Government of India deputed Dr. F. Day to investigate the freshwater fishery resources of South India. Later on Day was asked to go into the question of the fisheries of the whole of India and Burma. Day published two reports in 1873: the "Freshwater Fish and Fisheries of India and Burma" and the "Sea Fish and Fisheries of India." In the report on freshwater fisheries he drew attention to the widespread slaughter of breeding fish and fry, and urged legislative measures to conserve the fisheries. After a lengthy correspondence with the local Governments, the Indian Fisheries Act

(Act IV of 1897) was passed (see appendix No. XX) for the whole of India (except Burmaz), by which dynamiting and poisoning of waters for killing fish were absolutely prohibited. The Act empowered local Governments under certain conditions to frame rules for regulating (a) the erection and use of Fixed Engines, (b) the construction of wiers and (c) the dimension and kind of nets to be used and the mode of using them ; and, for prohibiting all fishing in any specified water for a period not exceeding two years. In regard to sea fisheries Day's endeavours resulted in the grant of duty-free salt for curing fish within fenced enclosures.

The Madras Government viewed that fisheries, an important food industry, demanded special attention, especially as it was in the hands of a backward community without capital or initiative and deputed Sir F. A. Nicholson in 1905 to investigate the fishing industry, both inland and marine of the Province. As a result of this investigation, a small department of fisheries was constituted by the Madras Government in 1907 with Sir F. A. Nicholson as its first Honorary Director. A large amount of detailed and useful work has been carried out by the Madras fisheries department in respect of preservation of fish under Indian conditions and in the uplift of the fishing population. During 1941 the Department of fisheries, Madras, was amalgamated with that of the Department of Industries and Commerce.

Other provinces followed Madras in the matter of fishery investigations. Sir K. G. Gupta enquired into the fisheries of Bengal (including Bihar and Orissa) in 1906 : Mr. W. H. Lucas into the fisheries of Bombay (including Sind) during 1908-10 and Mr. H. S. Dunsford into the fishery resources of the Punjab in 1911. A report on the fisheries of the United Provinces by E. H. H. Edye was published in 1923, of Baroda by James Hornell in 1930 and a revised report on the marine fisheries of the Bombay (including Sind) Presidency by H. T. Sorley in 1931.

In Bengal Sir K. G. Gupta submitted his final report in 1908 recommending artificial propagation coupled with a system of short closed seasons and other protective measures for fresh water fisheries, and the exploration of the Bay of Bengal by the Government, to find out where marine fish are to be found and investigations into how they should be caught and brought to the market. The Government of Bengal accepted the recommendations and appointed a fisheries Commissioner and an European Expert to carry out the investigations. A trawler survey of the head of the Bay of Bengal was immediately taken in hand and several investigations into the freshwater fisheries of Bengal and on Hilsa fish were undertaken. The Department of Fisheries, Bengal, Bihar and Orissa was, however, abolished in 1923. During 1938 the existing condition of the fishing industry of the Province was again investigated by an expert from the Madras fisheries department and the Bengal Government, in May 1942, revived the fisheries department with a view to organise the fish trade under War conditions, to conserve the existing supplies and to improve the yield of tank fisheries.

Mr. Lucas made several suggestions regarding marine fisheries of the Bombay (including Sind) Presidency but the only practical result which followed was an extension of the use of duty-free salt for the curing of fish at sea. As a result of Mr. Sorley's recommendations a fisheries Officer was added to the staff of the Industries Department, to investigate the easy enlargement of the fish curing industry and to extend to suitable local areas the use of motor boats for fishing or transport of fish.

In the Punjab, Mr. Dunsford wanted artificial propagation coupled with measures to prevent wasteful destruction of fish, in order to increase fish supplies in the Province. A fisheries department was constituted by the Punjab Government in 1912 which continued to exist as a separate entity till 1932. The duties are now carried out by a Game Warden under the administrative control of the Director of Agriculture, Punjab.

Research in fisheries has been conducted in India by—

- (i) Provincial and State fisheries departments ;
- (ii) Surgeon Naturalist to the Marine Survey of India ;
- (iii) Zoological Survey of India ; and
- (iv) Zoology departments of Calcutta and Madras Universities and in the biological laboratories of certain colleges.

Research on fishery matters is within the province of the Animal Husbandry Branch of the Imperial Council of Agricultural Research. In 1940, a committee appointed by the Council to review the present position of fishery research in India and to suggest steps for the development of this industry, recommended that provincial Governments having no fishery departments be apprised of the desirability of having an organization to survey their respective fishery resources. At the present moment a great deal of interest is being evinced in local fisheries by several Provinces and States. During the past few years fishery investigations have been started in Sind and Orissa Provinces and in Baroda, Hyderabad, Mysore, Cochin and Travancore States.

## (2) FUNCTIONS.

These may be considered under three convenient headings, viz., (a) Administrative, (b) Research and (c) Socio-economic and other activities.

(a) *Administrative*.—In most provinces fisheries Officers have to attend a great deal of routine administrative duties with the result that they are unable to devote themselves whole heartedly to research. In Bombay, Madras, Cochin, Travancore and Orissa the administration of fish curing yards claim the first attention of the fisheries staff. In non-maritime areas such as the Punjab, Jammu and Kashmir, in the interior of Madras Province, etc. fishery officers are busy with conservancy duties of a routine nature. These consist in administering the provisions of the local fishery Acts\*, issuing licenses for fishing and leasing government waters to private individuals.

It may be noted that the chief source of revenue to fishery departments is from the sale of salt in fish curing yards, leasing Government waters to private people for catching fish and by sale of fishing licences. As local Governments have insisted on the fishery departments being self-supporting, it has not been possible for even the fishery experts to dissociate themselves from these revenue-yielding activities. But in the interests of progress and research it is very desirable that the qualified fish experts should be relieved of these duties and be allowed to concentrate on scientific problems.

(b) *Research*.—The main divisions of research in relation to problems of fishing are (i) biological research dealing with living fish and their environment, (ii) technological research into methods of preserving fish from the time of capture to the time when it reaches the consumer and (iii) research into the design and equipment of fishing vessels and nets.

(i) *Biological research*.—In the sea, the presence of shoals of fish, their local movements and migration, their appearance and seasonal abundance have been shown to be due either to the reproductive urge or for food. Certain movements are also caused by temperature and climatic changes. Biological research in respect of sea fisheries, therefore, consists in making collections and examination of sea fauna of particular localities and noting data regarding temperature, salinity, direction and movement of currents, the extent of plankton supply and bottom organisms. It is only in the Madras Province that investigations of this nature are attempted. Even there facilities are limited and the research is carried out only with special reference to oil sardine and pearl oysters. To be of any practical value data in respect of biological and hydrographical conditions of the sea have to be collected for the entire coast line of India for a number of years and studied. These questions are of general interest to all and the investigation can be carried out efficiently only by the co-operative effort of all the maritime provinces and States.

In the case of inland fisheries the chief need is to develop the existing resources. Measures taken to improve the yields of fish from rivers, irrigation canals, lakes, ponds, etc. viz., protection, stocking, and culture, come within the province of biological research.

Apart from legislative measures such as prohibiting the use of small meshed nets and fixed engines and imposing a size limit below which no specified species can be killed, the chief method of protection of food fishes in fresh waters is by providing a closed season in specified waters during the spawning periods of important species: and to provide sanctuaries in spawning grounds of such species. The breeding habits of freshwater fishes, the places where, and the time of the year when, they spawn have to be ascertained by careful investigation before Section 6 (4) of the Indian Fisheries Act of 1897 can be invoked to prohibit fishing in any piece of water.

Fish experts in India are of the opinion that the construction of irrigation 'works in rivers have been detrimental to fisheries as these artificial obstructions reduce or even prevent the propagation and perpetuation of stock by the loss of up-stream spawning and rearing grounds. Investigations are necessary to determine to what extent the construction of a dam will prejudice the fisheries in a particular locality and where such dams are suspected to be injurious, what remedies are the most economical to adopt. After Day's report on Freshwater fish and fisheries was published as many as 18 fish ladders and passes have been constructed in different areas in new irrigation projects, but none of them has proved completely satisfactory. It is now realized that for success, the design and operation of a fish ladder or pass must be adapted to the fish and to the physical conditions of the dam for which it is intended. For this purpose a preliminary survey of every important basin or waterway, to ascertain both the migratory fishes and proper methods to safeguard them, has to be carried out before any irrigational project is taken in hand and due provision made in the design of the dam for safeguarding the fisheries.

Stocking and culture may be considered together. Certain food fishes, e.g., the carps, do not spawn in confined waters. Tanks and ponds have to be replenished with young fish in order to maintain supply at an economic level. The principal stocking methods adopted in India are (i) simply gathering the fry in streams and putting them in tanks and (ii) collecting floating impregnated eggs of various kinds with a piece of cloth, transporting them to small shallow ponds for hatching and when the fry are sufficiently grown, putting them in tanks. The above methods though widely adopted in Bengal, Assam, Bihar, etc., are not very satisfactory because the fry and

\*In the Punjab a separate piece of legislation (The Punjab Fisheries Act, No. II of 1914) was passed while in Madras Act II of 1929, the Indian Fisheries Act (1897) was amended to suit the local requirements.

spawn are not identified and it is not always that the fry of a quick growing economic fish is put in a tank. Besides, the collection invariably contains fry of predatory fishes which prey upon the food fishes.

Artificial fertilization of Hilsa eggs has been tried in Madras and Bengal. Adult breeders (male and female) were netted separately, the milt and ova were carefully removed, and the eggs fertilized and hatched in specially constructed tanks. The aim was to release millions of young Hilsa in rivers to supplement the numbers produced in the natural way. The problem of rearing the larval fish to the fingerling stage has yet to be solved and the work is still in an experimental stage. Artificial propagation has been successfully achieved in the case of the exotic game fish—trout. The hill rivers of Madras, Travancore, Punjab and Jammu and Kashmir, United Provinces, etc., are to day stocked with fry and fingerlings of trout obtained from trout hatcheries in the respective areas.

However, it is now recognized that a few spawners produce as much young as a battery of hatcheries and the keeping of adult fish under proper environmental conditions is largely displacing fish hatcheries in Western Countries.

Assuming that fry of economic species produced in the natural way would be available for stocking tanks, etc., a detailed study of their growth, food, diseases, parasites, etc., is necessary. The number that can be stocked in any tank and the nourishing properties of water in the different areas have to be investigated to work out the economics of fish culture in tanks. In the Madras Province there are over seven "fish farms", where this type of investigation is undertaken. The local fisheries department has initiated a survey whereby irrigation tanks and other inland waters are surveyed district by district and those found suitable are arranged in groups round fish farms and centres where fish breeding and rearing are carried on and whence each year fry of economic varieties are distributed for stocking. In India large inland fishing resources are government-owned and these are leased to private parties for short periods. In order to maintain fishery rentals at a satisfactory level, stocking operations have to be undertaken by Government. In Madras, the exotic fish Gourami and the Pearl spot (*Etroplus suratensis*) have also been successfully reared in captivity. The fry of these are also supplied by the fish farms.

Developing fish culture in tanks and ponds is specially important in Bengal. The recently started fisheries department in that province has this work as a main item in its programme. Tanks are being surveyed, the breeding grounds of principal carps of Bengal are ascertained and zones of fry distribution from each breeding centre are being mapped. Other inland provinces should also follow the example of Madras and Bengal in this important matter.

The natural oyster beds which are distributed all along the littoral area of India can be developed with judicious and scientific farming.

(ii) *Technological research*.—Biological and technological research should proceed side by side : the one aims at increasing the catch while the other in its profitable utilization. A good amount of useful work has been done by the Madras fisheries department in the development of methods for preserving fish. Technological problems which await attention, viz., icing, packing and marketing fresh fish, better curing and drying methods, improved processes for the manufacture of fish oil, medicinal Shark liver oil and fish fertilizer ; and prevention of bacterial attack in salted and dried fish have already been referred to in the pages of this Report. At every step the work of the laboratory will need to be supplemented by trial on a commercial scale and from such trials should evolve changes in the organization of the industry itself. This should be the aim of all technological research.

(iii) *Research into the design and equipment of fishing vessels*.—The fishing vessels and implements require improvement. As has been shown in Chapter II of the report the marine fishing gear now used in India are only suited to exploit a narrow belt of the coastal waters. Power boats would be required to extend the area of operations and the suitability of different power-propelled vessels and fishing implements, have to be tried out in Indian waters.

There is considerable scope for work on preservative methods for enhancing the useful life of fishing boats and nets. Proper preservatives ("Dips") for cotton and hemp nets will have to be worked out and their use popularized among the fisher-folk. This would help to save a considerable sum of money every year.

(iv) *Reorganization of fisheries research*.—Although development of the fisheries resources of India has engaged the attention of the Central and Provincial Governments from time to time in the past, it has to be stated that the matter has never been taken up energetically or systematically. The history of efforts made so far is one of local endeavour by a province or State without the unifying influence of a co-ordinated all-India policy and they have resulted in very little practical achievement. The comparative failure in developing fully the maritime and riverine fishing of India should be attributed to two reasons, viz., lack of adequate finance and the absence of an all-India organization to direct and guide the provincial and State fisheries departments.

By setting up a Fish Committee in 1940 (in which scientists, administrative officers and the fish trade are represented) the Imperial Council of Agricultural Research has taken the first step to remedy the defect. But the Council has not been able to, and cannot take up, much constructive work itself. Further progress can, therefore, be made only by starting a Central Fisheries Institute (c.f.i.).

charge of a Director of Fisheries Research (India). The Institute which should primarily be a research organization, and while controlling the work in various sub-stations opened for specialised work in suitable places, must undertake scientific investigations both to increase and conserve the fish resources of the country and the economic utilization of the catch. Its functions should be :

(i) to plan, co-ordinate, conduct and guide all relevant scientific researches in the country on the ecology and bionomics of Indian fishes and other aquatic products with a view to elucidating factors which influence their growth, movements, periodic fluctuations and development,

(ii) to conduct an investigation into the present state of the commercial fisheries in India with a view to opening and developing new grounds and new objects of fishery,

(iii) to carry out researches into the technological aspects of the fishing industry,

(iv) to devise suitable means for the proper marketing of the produce,

(v) to ensure the training of research and development personnel.

The Central Fisheries Institute should work under the Government of India just as the Imperial Agricultural Research Institute and the Imperial Veterinary Research Institute.

Development and practical utilization of the knowledge arising out of the researches should be the concern of a Central Fish Committee in which the provincial and State Governments and the fish trade should be adequately represented.

(c) *Socio-economic and other activities.*—Development of fisheries as a source of food is naturally the chief object of every fishery department. The fisher-folk in India are in general at a very low stage of social and economic development — their calling is despised ; as a class they are poor and deeply in debt ; they are ignorant and illiterate having in general neither schools nor teachers, while their absence day and night at sea places them largely out of touch with the rest of the population. In Madras it was felt that the industry could develop along right lines only when the producers (fishermen) are raised in status, intelligence, independence and wealth. To meet this end elementary (special) schools for fisher-children and night schools for fishermen in important fishing areas, organization of co-operative societies and propaganda work in fishing villages against intemperance and extravagance were proposed by the fisheries department. The provincial Government accepted these proposals and they were immediately giving effect to in the South Canara and Malabar districts. During 1942 there were 49 elementary schools in the two districts. A number of co-operative credit societies are functioning. Now attention is concentrated on starting societies which would pool and sell the members' catches either as fresh or cured fish. Inspectors who have been specially trained to deal with fishermen and their problems have been appointed to organize and supervise the fishermen's co-operative societies. Bombay has followed the example of Madras in the matter of organizing co-operative societies and in providing amenities for the fishermen. Efforts to induce fishermen to work in co-operation are made by the departmental officers in the Punjab, Bengal, Hyderabad State and Baroda.

To wean fishermen from their indebtedness to capitalists, to improve the methods of preparation for the market and the marketing of fresh and cured fish, organization of multi-purpose societies among the fisher-folk supervised by fishery officers and linking them with sale societies in consuming areas seem very necessary.

#### B.—Pisci-culture.

In India, every village has got one or more tanks. Agricultural operations in areas which receive a seasonal rainfall are conducted with water stored in irrigation wells. The perennial tanks and wells, with care and attention and application of right methods are capable of providing an unfailing supply of good fish. Fish can be "cultivated" just as vegetables are grown in a kitchen garden. In many parts of central Europe, America and Japan, fish culture in ponds and tanks is a part of the agricultural practice. In Japan, aqua-culture is greatly encouraged and the Government bear 70 per cent. of the expenses incurred for the selection of spawn, etc., when the work is undertaken by prefectures or fishery associations. In 1934, there were 163,549 pisci-culture establishments in Japan, occupying 131,000 acres and yielding fish worth Rs. 18,650,000.\*

In Pisci-culture, the tank is selected and "prepared" and fry of suitable varieties that grow quickly are planted in it. The preparation consists in removing predaceous fishes, silt, decaying organic matter and coarse vegetation. Regarding fry, carps are universally liked and there are several edible varieties indigenous to this country. There are also the exotic Java fish *Gourami*, the Pearl spot, freshwater mullet, etc. of which the fry can be obtained in India at a small cost. The fry are supplied free of charge by the Department of Agriculture in the Punjab. In Madras they are charged for : Catla fingerlings cost Rs. 5/- per 100, *gourami* Rs. 10/- per dozen and other varieties from Rs. 4/- to Rs. 5/- per 100. The fry has to be transported in suitable aerated containers. In the Punjab, it is estimated that netting, packing, transport, etc., charges would come to Rs. 15/- per 100 miles per 1,000 fry.

In the words of Sir F. A. Nicholson "In India an acre of average water will, with proper care; produce as great a weight of food as an acre of average land, while its money value will be much greater. The utilization of ponds by pisci-culture not only costs less than arable cultures, but is far

less liable to seasonal uncertainties, while the water is still available for other purposes and is even improved by fish growth. The stocking should necessarily be accompanied by a carefully planned fishing programme so as to spread the supplies over the whole year round".

Irrigated and flooded fields can be used for growing fish. The operations conducted in Japan can be given as an example. Carp fingerlings are introduced into the irrigated rice fields and they are found to grow to a marketable size by the time the crop is ready for harvesting, i.e., in four months. On account of the warmth and richness of planktonic life, the growth of fish in shallow water fisheries is rapid and within a few months they attain a size of a foot to 18 inches which normally would require two years to attain in an average perennial tank. The fish does not injure the crop ; on the other hand, it helps the cultivator in destroying the insect pests. In India, it is in the irrigated or flooded locations that the fry most abound and generally during the monsoon rains every little stream and piece of water is resorted to by them to obtain food in. In the fields which are divided off into embanked spaces in order to distribute the water, the fry obtain an entrance along with the water which is fortunately at a depth to suit their puny size. Food is abundant and except birds there are but few natural enemies for the fry to contend with. The water is conducted from fields to field, but the arrangement instead of providing an excellent nursery for the young to develop has been ignorantly used by man to place traps at every out-let and destroy all the young fish as they drop downwards. With intelligent propaganda and no extra expenditure, the rice fields may be made to yield literally a "double crop". If the rice and jute acreage in Bengal, for example, were intelligently used for growing fish, it is estimated that the farmers would gain an additional income of Rs. 5 crores.\* During the present War emergency, the additional supply of fish would help to meet the food shortage.

Fish culture has one other advantage. From confined waters small fishes of most varieties destroy mosquito larvae and thus help to keep down the menace of malaria and other mosquito-borne diseases. Special larvae devouring fish such as *Haplochilus*, *Panchar*, *Chelu* and *Barbus* are supplied by the fish farms in Madras and the Punjab for stocking waters in malaria-infested areas.

#### C.—Propaganda.

A very important method of publicity and of education in fishery methods is by means of exhibits at fairs, aquaria and museums. Attractive displays of fishes and fishery products are seldom put up in the various exhibitions held all over the country. Salt cured marine fish should be exhibited in exhibitions which are held in localities where such forms are not known or popular, to stimulate demand. There are only two aquaria in India, one in Madras city† and the other in Trivandrum. The Madras aquarium was very popular and was earning a profit every year. If aquaria can be established at Bombay, Karachi and Calcutta, they would play an important part in making the public think about the fisheries. In America, the Bureau of Fisheries makes use of a portable aquarium to educate the public about marine and freshwater food fishes, the hatching of eggs and pisci-cultural methods as well as in matters relating to fishing boats, appliances, specimens of buttons and other articles made from aquatic products. The aquarium is taken to different "expositions" all over the States. A portable aquarium would be extremely useful in India for educating people in the inland areas about the marine food fishes. Museums are performing a very useful function and the wax casts of important food fishes in the museums at Bombay, Calcutta and Madras are attracting a great number of visitors.

Other methods of propaganda are by organization in the fishing industry itself for the purpose of conducting extensive advertising and by Government publicity. In England an advertising campaign known as the "Eat More Fish" campaign has been in operation since 1929. It was inaugurated by the British Trawlers' Federation and financed by means of a levy of one pence in the pound sterling on the value of the fish landed by vessels of owners who have agreed to support the scheme. The publicity campaign is designed to educate the British public to a better knowledge of fish as a food and the best methods of utilizing the kinds of fish which are available daily. Besides this, the Empire Marketing Board, by means of posters displayed on stands throughout the United Kingdom, and by the issue of books of recipes for cooking fish, has done much to popularise fish as an article of diet among the British public.

In this country, a number of fishes are little utilized to-day by urban consumers, either because of the unfounded prejudice against them or the ignorance of the consumers regarding their qualities. Many of these fishes are excellent as food, e.g., sharks. Propaganda campaigns to familiarise the public with the qualities of these fishes should be undertaken. Owing to the development of an indigenous medicinal Shark liver oil industry in India, cartilaginous fishes are now caught in large numbers. Their flesh unfortunately is mostly wasted.

It is understood that the Information and Broadcasting Department of the Government of India have the following publicity material under preparation or consideration in respect of Fisheries in its "Reconstruction Publicity Campaign".

(a) Press advertising to stimulate interest in the post-war fishery development.

\*Hora : Indian Farming, Volume IV (1943), page 232.

†For security reasons, the Madras Aquarium situated on the foreshore was temporarily closed during March 1942.

- (b) Broadcasts to explain the nutritional importance of fish, India's fish resources and how they are to be exploited.
- (c) A documentary film on fisheries.
- (d) A pamphlet on agriculture which will include a chapter on fisheries.
- (e) A Food Magazine which will devote some space occasionally to fish foods.

This Department feels that when post-war schemes of fisheries development and marketing are taken in hand, it would be worth-while to have a wholetime Fisheries Publicity Officer with the Information and Broadcasting Department as his parent Department but working in close liaison with the Marketing Department and the Fisheries Adviser to the Government of India.

#### D.—Statistics.

Accurate statistics are needed to study fisheries scientifically. In this country, collection of fish statistics offers great difficulties due both to the ignorance and conservatism of the fishing classes and the scattered nature of the industry. The Madras fisheries department has been collecting "approximate" statistics of catches of sea fish with the help of the fish curing yard staff. The data relating to the West Coast only are reliable. Not even a rough idea of freshwater fish caught in this country is available. It is necessary that the fishery departments in provinces and States (the established ones as well as those which would be started) should carry out detailed periodical surveys of the fishing resources, the varieties available, the quantities of each important variety caught and the number of boats, nets and other fishing implements in use.

### SUMMARY.

#### Commercial fishes of India.

In a country of the size of India with its extensive sea-board, perennial rivers and irrigation canals and innumerable rain-fed tanks and *jhils*, the physical and biological conditions under which fisheries exist are very varied.

Fish are caught where available from every piece of water. The chief sources of supply are the coastal margins of the sea, river estuaries and backwaters for marine and estuarine fish, and rivers, irrigation and other canals, tanks, inundated tracts, etc., for freshwater fish. India has a coastline of about 3,220 miles and the total area of the sea which lies between the coast of the 100 fathom line is approximately 115,000 square miles. Only a small portion of this area is worked.

The estuarine and riverine fishing of this country are important and they already supply considerable quantities of fish in many inland areas. In India, only a few of the confined waters, e.g., tanks, lakes, *jhils*, etc., are devoted wholly or in part to deliberate food production (pisciculture).

In a large sense, the word "Fish" includes not only the finny tribes but also *Crustacea* like prawns, lobsters and crabs, edible *Molluscs*, e.g., oysters and clams, and pearl oysters, chanks and other shells. About fifty of these aquatic animals are commercially important. Pomfrets, seer, perches, certain types of Jew fishes and mullets among sea fishes and Rohu, Catla and several varieties of cat-fishes caught from freshwater, are popular among the consumers. Among marine fishes Sardine, Mackeral, Sharks and cat-fishes, although not so well known are commercially important.

#### Fishing gear.

In the sea fishermen catch fish very near the shore and do not go beyond a distance of 5 to 7 miles. The crafts (canoes and *catamarans*) are small and un-decked; they usually start in the morning and return in the evening and the practice of staying out for weeks is not practicable. All large rivers, tanks, backwaters and estuarine regions of rivers are intensively fished. As regards nets and other fishing implements, these are such as would help the capture of particular fishes. Bag nets, drift nets, inshore drag nets and long lines are used in marine fishing. For fishing in rivers, backwaters, tanks, etc., spears, traps, baited springs, harpoons and other similar ingenious devices are employed. Cast nets are very commonly used while fishing in shallow waters.

Power fishing of Indian seas has only been tried on an experimental basis on a few occasions. Further experiments to determine the best types of fishing vessel and gear suited to Indian conditions, i.e., a power boat which will catch marketable fish in commercial quantities and at competitive rates, have to be conducted. In view of the magnitude of problems Government will have to carry out these experiments and thus lead the way.

### Supply.

In the absence of reliable statistics it has been possible only to estimate the landings of fish in India. Inclusive of fish caught in estuaries and backwaters the total annual production of marine fish is estimated at 116.7 lakh maunds valued at Rs. 302.7 lakhs. It has been possible to estimate only the marketable surplus of freshwater fish, which amounts to 62.6 lakh maunds valued at 742.3 lakh rupees per year.

The average cost of sea fish is only Rs. 2.10-0 per maund against Rs. 11.14-0 per maund for freshwater fish.

Madras Province accounts for nearly 40 per cent. and Travancore 22 per cent. of the total sea fish landed. In the former, the area of concentrated production is the West Coast littoral comprising South Canara and Malabar districts. The South-West Coast of India consisting of the maritime districts of the Madras Province and Cochin and Travancore States, with but a coastline of about 430 miles, accounts for over 52 per cent. of the total marine fish landed in India. The share of Bengal is nearly 15 per cent. (the majority of the catch being estuarine) : that of Bombay 12 per cent. while those of Orissa and Sind are 2.6 and 1.7 per cent. respectively.

The "Herrings and Anchovies" account for over a third of the total catch of marine fish. "Mackerels and Perches" in which group are included the diminutive but numerically abundant Indian mackerels, the coarse horse mackerels and the large and toothsome beckti comes next with 21.7 per cent. of the total catch. Prawns constitute the chief item in the group "Crustaceans" and this group occupies the third rank with 10 per cent. Pomfrets, mullets and Indian salmons, although very popular, are caught only in comparatively small quantities.

Regarding freshwater fish Bengal leads, her share of the catch being nearly 50 per cent. of the total marketable surplus of freshwater fish in India. In Bihar and Assam also freshwater fisheries are important, the shares of these provinces being 15.3 and 11.5 per cent. respectively of the marketable surplus of freshwater fish. The Indus in Sind, the Mahanadi in Orissa and the Ganges with its tributaries in the United Provinces yield 4.3, 5.2 and 2.8 per cent. of the Indian total.

Fishing goes on in the sea all through the year except when the weather is squally, which is so when the monsoon winds are strong. Rivers are generally not fished during the rains except in Bengal. Tank fishing is prosecuted with vigour when the level of water in the tanks is low, i.e., during early summer. In general, fish production is concentrated during the period September to February and is lowest between May and July.

Wide variations from year to year occur in the quantities of marine fish landed as well as in the different species that make up the total catch. There has not been any recent developments in canning, and pickling industries or in the manufacture of fish meal. As far as sea-fisheries are concerned the available data show that the industry has made very little progress in recent years. Regarding freshwater fish the consensus of opinion is that the fisheries are deteriorating. Several reasons are given for this, such as the construction of dams and weirs, silting up of rivers, over-fishing, destruction of immature fish and pollution.

### Imports and exports of fish products.

There is practically no import of raw fish into India. Considerable quantities of preserved fish, e.g., dried fish (salted or unsalted), wet-salted fish and canned fish and fish products such as Cod liver oil and fish manure of total annual average value of Rs. 16 lakhs are imported. Of these products, all except canned fish and Cod liver oil are imported from adjacent countries like Arabia, Muscat territory, etc. India had an export trade in preserved fish with Ceylon, Burma, Straits Settlements and Hong Kong, valued at over Rs. 75 lakhs per year.

### Per capita consumption.

The average *per capita* consumption of fish in India works to 3.4 lb. per annum, though actual consumption in different tracts varies widely. The highest consumption

is observed in maritime tracts on the West Coast. Fish is a very popular item in the diet of a Bengali and the *per capita* consumption in the province is 6.73 lb. Among completely inland areas Assam leads with a *per capita* consumption of 3.64 lb. followed by Bihar with 2.00 lb. The consumption in the Punjab is the least being only 0.09 lb. per annum.

#### Utilization.

One half of the total production is consumed as fresh fish : one-fifth is cured by salting, another one-fifth is simply sun-dried while approximately 10 per cent. is converted into fish fertilizers. There are a number of varieties of fish caught from the sea which are little utilized as food either because of unfounded prejudice against them or of the ignorance of the buying public regarding their quality. As a result these varieties have to be converted into industrial products like manure, guano, etc., instead of being consumed as food.

#### Preparation for the market.

The marketable surplus of fish caught from rivers, tanks and other inland resources is almost wholly consumed as fresh fish. The preparation of such fish for inland markets in most parts of the country consist in merely eviscerating the fish and washing. Regarding sea-fisheries the position is different. The industry is scattered over a long coastline and fish supplies are irregular. The method of catching, the smallness of boats and certain established customs hinder the adoption of steps which could keep fish free from taint during transit from the moment of catching to the shore. The boats have to stay for hours to get a sufficient catch during which time the fish heaped in them get trodden upon and are exposed to the full glare of the sun. Outside the comparatively high class markets in the coast and a few places scantily served with fish with ice the supplies of fresh marine fish in India is largely tainted. The bulk of the sea-fishes are sun-dried or cured with salt and in this form reach consumers inland.

The Government of India allow salt free of duty for curing fish under certain conditions, fish curing yards—enclosures where salting of fish is carried on—are found in maritime areas ; the largest number is in the Madras Province, where over 65 per cent. of the production of salted fish in the country is concentrated. It is estimated that 15.5 per cent. of the total *sea-fish* caught is salted in fish curing yards 13.4 per cent. being dry-salted and 2.1 per cent. wet-salted. In Bengal, Travancore and Bombay, sun-drying is the popular method of preserving fish. Nearly 31 per cent. of the total catch of sea-fish is sun-dried without the application of salt. It is estimated that in all about 60 per cent. of the total catch of sea-fish is salted or sun-dried. The corresponding percentage in the case of freshwater fish is only 1.4.

#### Prices.

Fish prices rule high in urban markets, but facilities for getting fresh fish where these are in demand from distant producing centres are yet comparatively undeveloped. In most areas local conditions alone determine the price.

Fishermen get a lower price for fish sold for manufacturing purposes and a higher price for fish sold for consumption as fresh fish. Certain marine varieties, e.g., pomfrets, seer, beckti and carps and live-fishes caught from freshwater are prized by consumers and fetch higher prices than other economic varieties regarded as somewhat coarse.

#### Assembling, storage, and distribution.

The marketable surplus of fish is disposed of by the fisher people (i) either by themselves taking it to the nearest market or assembling centre or (ii) by selling at landing *ghats* to intermediaries who take it to the assembling centres. These intermediaries include agents of middle-men, boat-owners and curers, village merchants and itinerant dealers. Owing to the perishable nature of the commodity, transit from producer direct to the consumers is possible only when the market is within a distance of 10 miles from the producing centre. The fisher people play only a small part in the actual distribution of fish as their financial obligations leave them little choice for disposing of their catches except to the creditors.

Co-operative Societies play only a very minor part in the marketing of fresh and cured fish. The existing societies, with a few exceptions, are simple credit societies.

Many villages and towns have fish markets where fish are assembled and sold, but this often consists of an open space only. In certain cities, the Railway premises serves as a market place for fish arriving by train. There are stalls for retail sale of fish in the municipal and cantonment markets in most of the cities. In the principal towns and cities in Northern India, adatya's mandis serve as wholesale fish markets for freshwater fish.

Fish and fish products are highly perishable; attempts are, therefore, made to dispose of stocks as quickly as possible even at a smaller margin of profit. Fresh fish is not stored in any consuming centre for more than 24 hours. Only in certain parts of Bengal are dried fish stored for use during the time when fresh fish is not available. In other parts of the country 2-3 weeks is the carry over period during which preserved fish reach the consumers.

The means of transport employed in the marketing of fish are head-loads, shoulder slings, pack animals, bullock carts, boats and pony carts. Motor lorries and trains are used wherever available. Bicycles being cheap and speedy are quite popular. The transport actually used varies from tract to tract and depends upon local custom, the quantity and type of fish to be handled and the distance which has to be travelled. Fish carried by rail is charged for at half parcel rate. Baskets, gunny bags, wooden cases and earthen pots are used as containers for fresh fish and cocoanut, palmyrah and screw-pine leaf mats for packing preserved fish.

Fishermen in most parts of the country are indebted to the middlemen and are practically at their mercy.

The producer's share in the consumer's price is high when fish is sold for consumption in the producing area. It is lowest, being about 30-40 per cent. when the fish is sold in retail at distant markets.

#### Reorganisation of fisheries research.

The development of fisheries resources of India engaged the attention of the Government of India for a number of years during the last century and resulted in the passing of the Indian Fisheries Act (Act IV of 1897) and the grant of the concession of duty-free salt for curing fish. The Governments of Madras, Bengal and Bombay (including Sind), United Provinces and the Punjab have during the last 30 years established fishery departments to develop their local fisheries. Due, however, to the lack of a co-ordinated policy for developing the marine and riverine fisheries of India as a whole, the efforts of the Provincial Governments have resulted in little practical achievement.

The Fish Committee of the Imperial Council of Agricultural Research which was set up in 1940 has been instrumental in directing fisheries research in the Provinces and States and co-ordinating the activities of the Provincial fisheries departments to some extent.

To plan, co-ordinate and guide pure and applied fisheries research in the country and for training the research and development personnel, a Central Fisheries Research Institute in charge of a Director of Fisheries Research (India) is urgently required. A Central Fish Utilisation Committee should also be established to develop the knowledge arising out of these researches.

#### MAIN CONCLUSIONS AND RECOMMENDATIONS.

##### I.—Codification of existing fishery literature.

From time to time in the past investigations have been carried out in maritime provinces and certain Indian States on fishery problems of local interest. But the literature dealing with these enquiries is very scattered. In order to avoid duplication of work and to chalk out a development programme it is desirable to have the existing information suitably codified and catalogued.

It is recommended that the Imperial Council of Agricultural Research may arrange to get this done by making a suitable grant to a Fishery Expert for the work being done under his supervision.

## II.—Habits and habitats of food fishes.

Very little information is available regarding the food, migration and spawning habits of the marine and freshwater fishes of India.

It is recommended that investigations into the habits and habitats of the food fishes of India according to a pre-determined plan, approved by the Fish Committee of the Imperial Council of Agricultural Research be taken in hand by the fisheries departments in provinces and States and the information collected be *consolidated* by a central authority, e.g., Imperial Council of Agricultural Research, and published with a standardised nomenclature.

## III.—Fishing gears.

Several types of fishing vessels and implements are in use. At present the marine fishing vessels are capable of exploiting only the coastal waters from 5 to 7 miles from the shore. The implements, though effective to a considerable extent, are small and their application is limited by the manoeuvrability of the fishing vessels.

The sea is capable of and can stand more intensive exploitation than that carried on at present. But before introducing modern deep-sea fishing methods—power boats and more efficient fishing implements—data regarding the nature of the fishing grounds, their potentialities and the suitability of the contemplated gear to local conditions should be collected. A few experiments with trawlers have been conducted in Indian and adjacent waters: these have shown that this method is *not very suitable* for India (page 11). Other available modern methods, e.g., seining, drifting and long-lining which enable the catching of surface and mid-water swimmers have to be tried out.

Harbour facilities are meagre in this country: the improved fishing boat, therefore, while having a larger cruising radius, carrying capacity and speed should also be capable of being beached securely and launched against a heavy surf. Several suggestions such as motor boats, cobles, drifter-trawlers, Danish seine nets, large drift-nets, etc., have been made regarding the types of power boats and fishing implements that might suit Indian conditions. It is recommended that at the end of the present War these should be tried out in a series of carefully planned experiments and as far as possible on commercial lines.

## IV.—Statistics.

Fish statistics for the whole of India are not available. Use may be made of the subordinate officials of the fisheries departments to approximately estimate the quantities of each commercial variety caught, as is done now in the case of marine fish by the fish curing yard staff in the Madras Province.

Information is not also available in respect of the potentialities of chief freshwater fish resources of the country. A survey of the inland fisheries with a view to estimating the quantities of different commercial varieties of fish caught annually from each should be undertaken early.

The annual landings of marine or freshwater fish are subject to wide fluctuations (pages 18 & 19). The statistical enquiry should, therefore, be continuous for at least a period of five years and will have to be repeated quinquennially thereafter. The information collected, as also detailed fish curing yard figures *viz.*, quantities of the different varieties salted, the weight of cured fish produced, etc., should be published in the annual administration reports of the fisheries departments.

It is also recommended that an enquiry be undertaken to ascertain the types of fishing boats and tackle and their numbers used in the whole of India: the information should be consolidated and published by a central authority *e.g.*, Imperial Council of Agricultural Research.

### V.—Fish carriers.

Sailing boats and a few power-propelled launches are used for the rapid transport of fish from fishing vessels or from producing areas, to consuming centres in certain parts of the country (page 30). It is recommended that motor boats equipped with an ice-room for storing the fish be operated from suitable bases in the marine and estuarine fishing areas of the country.

Motor boats should be supplemented by motor trucks for road transport and better types of wagons for rail transport. There should be an all-round speeding up of the movement of fish from the producer to the consumer.

### VI.—Gutting and cleaning.

Eviscerated fish keep wholesome for a longer time than round fish. The entrails and inedible matter account for 15 to 20 per cent. of the weight of fish and evisceration, therefore, reduces the weight to be transported. There is, however, some prejudice against buying dressed fish in certain areas. The fisheries departments should induce fishermen to gut and clean the fish soon after landing and educate the public to accept such fish. When gutting and cleaning is done in an organised manner, it is possible to salvage the inedible matter and convert it into a valuable nitrogenous fertilizer.

### VII.—Refrigeration and storage of fresh fish.

Freezing and cold storage of frozen fish do not appear economical in this country at present due to the cost involved and low cost of fish.

The use of ice for packing fresh fish during transport is popular and should be encouraged further by making ice available at all important producing centres. Chilled rooms for temporary storage of iced fish should be provided in all large consuming centres. These should accept fish for storage at *daily* rates. They should be situated at the landing ghats or in the wholesale assembling markets (page 31).

### VIII.—Fish canning.

The difficulties in the way of establishing a fish canning industry in India are (i) absence of regular supplies of suitable fish, (ii) lack of good and cheap containers, (iii) a short canning season (iv), a small demand for canned fish from the Indian public.

There are technological difficulties also such as the presence of hard bones which are not softened by the usual processing.

The main operational difficulty, *viz.*, regular supply of fish in prime condition and at cheap rates can be overcome by having a mobile cannery (page 32).

There are good prospects for operating four such mobile canneries with bases at Karachi, Bombay, Cochin, and Kidderpore (Calcutta) (page 32).

For stimulating, instructing and aiding private enterprise, the local Governments should maintain canning experts who should also investigate the technical problems connected with the industry. Recipes which would appeal to the Indian taste should be worked out and the possibility of canning crabs, oysters and prawns in addition to fish and the manufacture of fish pastes should be investigated. Canned marine produce should be graded as soon as possible according to certain defined standards.

### IX.—Smoking.

Smoked fish is not popular with the Indian consumers. Smoking, however, is a simple process and smoked fish can be produced in every fishing hamlet. The process will come in very handy whenever there is a glut in a local market. A variety of products can be obtained by varying the intensity or the duration of smoking (page 36). Adoption of this method of cure would enable a larger percentage of the fish caught to be used as food.

Smoked fish readily appeals to European taste. The fact that there are troops stationed in several cantonments all over India opens up the possibility of a large and

immediate market for smoked fish in this country. By educative propaganda conducted by fisheries officials in provinces and States smoking can now be introduced as a method of fish preservation and it would have established itself by the time normal conditions are restored.

### X.—Fish curing.

There are several practical difficulties in introducing far reaching reforms in the fish curing industry (page 40). The following improvements can, however, be effected without much expenditure of time and money.

(i) *Handling in boats.*—Fish should be stunned to death and properly stowed in boats without being trodden upon or needlessly exposed to the sun. Their transport to the shore should be expedited.

(ii) *Cleanliness.*—Cleanliness is of vital importance. The boats and baskets, as well as the curing shed, salting tubs and drying yards should be kept scrupulously clean. To bring about some appreciable improvement it is recommended that the Bombay Government's plan (page 38) of constructing model curing sheds at Government expense and recovering the outlay by levying a cess on salt sold, be adopted on a wider scale in all Government fish curing yards.

(iii) *Only fresh fish to be used.*—Only fresh and wholesome fish should be used for curing. In other words curing operations should commence as soon as boats have landed their catch.

(iv) *Sun-drying.*—Only thin varieties should be sun-dried. These should be spread on loosely woven bamboo trellis-work which should be supported on raised platforms.

(v) *Curing with salt.*—The defects generally noticed are : (a) the amount of salt used is often insufficient, (b) the fish are left for too short a period in salt, (c) the fish are not washed clean when taken out of the curing vats, and (d) the fish are dried on the ground so that the underside does not dry properly.

It is recommended that research be undertaken in all maritime provinces and States to determine the correct proportion of salt for preserving different varieties of fish, types of cure and seasons of the year. The methods of cure should then be standardised and the operations in curing yards—especially in model curing sheds—should be strictly according to the approved method. The Imperial Council of Agricultural Research and the Board of Scientific and Industrial Research should favourably consider the financing of such schemes.

### XI.—Fish curing yards and duty-free salt for fish curing.

The Government of India allow the use of salt free of duty in fish curing and in other manufacturing processes under certain conditions. In the case of fish curing, the operations have to be conducted in a fenced enclosure and a weight amount of salt bearing a certain proportion to the quantity of fish presented, is issued to a fisherman. The yard officer, although a servant of the provincial fisheries department, does not exercise any supervision on the curing process. The issue price of salt is high as the local governments recover maintenance expenses of the yards and certain other charges from the curers (page 36). New yards are not opened in places where there are reasonable chances of impoving the fish business : such applications are entertained only when the curers undertake to provide land, buildings, etc., (page 36). Fish curing yards were originally established in the interests of public health and by setting up these yards the Central Government was saved the trouble of designing and administering measures against the preparation of salt from sea water—the so called salt earth.

To improve the quality of salt-cured fish and to increase its quantity it is recommended that :

- (a) trained personnel be appointed as yard officers,
- (b) they be held responsible for the quality of cured fish produced,
- (c) fish curing yards be opened wherever there are reasonable chances of increased fish business, and
- (d) the issue price of salt be reduced.

### XII.—Manufacture of fish oil.

The simple process of extracting medicinal oil from shark livers and "body" oil from oily fish should be taught to fishermen.

It is recommended that the production of medicinal oil be developed on a cottage-industry basis, the provincial fisheries departments making necessary arrangements for collecting, testing, blending and marketing the oil. Research should be conducted to discover suitable diluents for blending with the medicinal shark liver oil. "Concentrates" should also be prepared and put on the market.

### XIII.—Units of sale and basis of price quotations.

In the primary markets of India fish is never weighed. The units of sale for fish vary according to the types of fish, available supplies and the locality. In view of the rapidity with which the quality of the fish deteriorates under our climatic conditions it is not always practicable to weigh the catch before sale. But the provincial fisheries departments should explore the possibility of using "standard" baskets in producing areas with a view to approximately ascertain the weight of the catch landed. When this has been adopted, it should be easy to induce fishermen to quote prices on the basis of standard weights.

### XIV.—Co-operative marketing of fish and fish products.

Fish has to be consumed in as fresh a condition as possible, or should be preserved in such a manner that its palatability and nutritive value are not seriously impaired. The economic need of the fishing industry is to secure a more uniform supply: it cannot be secured by regulating the quantities landed: it has therefore to be found in the process of marketing. The fishermen play only an insignificant part in the disposal of the catches: the marketing is almost entirely in the hands of middlemen.

Fishermen are at a very low stage of social and economic development and are hopelessly indebted to the middlemen.

Due to the high cost of ice and the vast distances to be transported the possibilities of a marked rise in the consumption of fresh fish—especially sea fish—in the interior of the country are very limited. There is already a fair demand for preserved fish in the interior of the country. With wise propaganda it would not be difficult to popularise the consumption of preserved fish in areas where this type of food is still unfamiliar provided better methods of salting and drying fish are adopted in the producing areas.

The cost of adopting improved processes is beyond the means of an individual fisherman. The solution, therefore, lies in the formation of Fishermen's Co-operative Societies. These should be multi-purpose Societies. Firstly, they should arrange to provide all the daily necessities of the fishermen. Secondly, they should accept payment by fishermen in kind, i.e., fresh fish and they should dispose of the pooled catch of the member fishermen either as fresh or cured fish. The Societies should always aim at producing a superior article for the market. In the South Canara district of the Madras Province a few such Societies have been started and they are working very successfully (page 63). It is recommended that the provincial fisheries departments should actively encourage the formation of producers' societies. Specially trained co-operative inspectors should be drafted to supervise their working. These societies should be linked with co-operative sale societies in consuming areas for marketing the products.

*Commercially important fishes with their scientific, popular and the more common Indian names.*

(i) *Six fishes.*

Name of fish.	Popular name (English)	Bengali.	Canarese.	Malayalam.	Marathi.	Sindhi.	Tamil.	Telegu.	Special names in certain regions. (The name of the locality is given within brackets.)
<i>Carcharias gangeticus</i>	Ground shark of the river.	Hanger	Bugga karuvai, Palai.	Voliya aravu	Waghbaer	Anis-mohr, Mangra, Saifer, Karh	Murdan sora	Sora	
<i>Galeocerdo rayneri</i>	Skark	—	Pil-thatte	Pullian aravu	—	—	Valuransora	Kettalum	
<i>Zygopterus blochii</i>	Hammer-headed shark.	Julia, Magar	Kebihatto	Kannankodi	Zori, Kanere	Boether	Komban so-ra, Kenna sora, Velamin, Illappa.	Sappa sora, Yalla, Hadithi meeny.	
<i>Pristis ouospidata</i>	Saw fish	Khanda magar.	Chakru-thatte	Valu stovu	Kandere	Lisro	—	—	
<i>Rhynchoselatua dieffenbachii</i>	Skate	—	Etti-baliar	Matana sava-va.	Varithalai	Ranis.	Kair, Kahaasg	Kachig uluwai	Wahwah tan-ko, Nulu-lavi.
<i>Trygon sephen</i>	Sting ray	Shankush	Kottai thorake	Kottivalan, Padayan therandi.	Goval pakat	Pitan	Attuvanal tirukkai.	Belugiri tenku	Lang (Bombay). Fechia (N. Can.). ara.
<i>Muraeneox talbonoides</i>	Eel	Bam.	Bam.	Pambu-meen	Wam, Bale	—	Vilang, Kuzhippambu, Kota, Mandai kolera	—	
<i>Arius dussumieri</i>	Cat-fish	—	Mogam shede	Valin-etta	Shingala	—	Keluthi	Jedi jella	
<i>Arius sans</i>	Do.	—	Shede	Onan etta.	Do.	Khago.	—	Mullu-valai	Mullu-valaya.
<i>Chirocentrus dorsh</i>	Silver-bar fish	Khanda	Karli	Mullu-Vala	Karli, Datali	Pussunt	—	Paichalai, Nornalai.	Noona Kava-llu.
<i>Clupes longiceps</i>	Oil Sardine	—	Baige	Nalla-methi	Haid, Torli	Lowar.	—	Sudai	Do.
<i>Clupes sinensis</i>	Sardine	Khairs	Pedi, Erebai	Chala-mathi, Cuttay-phar-ley.	Pedwa, Washi	Kich-uk-jonar	—	Palash	Poravally.
<i>Clupes ilisha</i>	Hilsa fish	Hilsa	Paliya	Paluva	Pala	Pulla, Palo	Ullam.	—	Peruve, Net-hal.
<i>Engraulis parvus</i>	Anchoovy	—	Manangu	—	Manangu	Kati	—	—	Pussai (Oriya).

<i>Argentarius telata</i>	Gangetic an- chovy.	<i>Phanta</i>	Tel tampri, Neharu, Lo- tia.	Do.	Kati	—	Engallu
<i>Harpedon nehereus</i>	Bombay Duck	—	Bummali	Bombil, Bummalo.	—	V. namattlu.	V. namattlu.
<i>Scomber morolepidotus</i>	Indian mack- erel.	Bangada	Ala	Kaula gedar	Obia gedar, Bagada.	—	Vangarvasi
<i>Cyprin guttatum</i>	Seer	Bijran	Khulkul, Auk- ulsi, Jhavar.	Tarimeen	Towar	Surmai	Kamangoda- chalu.
<i>Cybium commersonii</i>	Do.	Champs	Artukai	Ayakors	Tivar anjari	Kirgan	Vanjiranu
<i>Lates calcarifer</i>	Beckti, Cock- up.	Beckti	Koliji	Chemballi, Nari qeen.	Fitadar, Kha- jura, Guri.	Dangra, Dan- dio, Jitara.	Vanjiranu
<i>Trichiurus hannoek</i>	Ribbon fish	Rupa petia	Pambole	Thahayan	Pituriukti, Ba- la, Wagti.	Chooreemachi	Vanjiranu
<i>Caranx ormenoniphthal- mus</i>	Horse mack- erel.	—	Thiriyande, Parei.	Chamban, Pare, Kooli- para.	Labi	Sanaf	—
<i>Equula splendens</i>	“Silver belly”	—	Kansikurichi	Thali mullan.	Katali, Tita- ka.	Parai	Vanjiranu
<i>Stromateus</i> spp	Pomfret	Chanda	Manji, Thon- drette, Chan- drayya (black).	Avoli	Chandava, Halwa (black).	—	—
<i>Plagios</i> spp	Flat-fish, “Soles”	Kulurjibh, Kantal patta.	Nangu	Manthal	Rhepti, Saliva.	Pitu usaga	—
<i>Mugil spilopteri</i>	Grey mullet	Phaeogen	Shevta, Pare.	Thirtha, Maslan.	Mengin boir.	Chouthees, Chail.	—
<i>Polynemus tetradactylus</i>	Indian salmon	Guchhia, Sahal.	Vanneu	Bameen	Rewas ”, Chelachi.	Rhei	Jerree-potoo.
<i>Polynemus paradiseus</i>	Tapi, Mango- fish.	Tupsee Ros, Poma.	—	—	Dodywa ”, “ Ghol ”	“ Rewas ”	Meini (S. Queen), Nators (Orissa).
<i>Solenia discanthus</i>	Jew-fish	Balde	Kora	—	—	Kathlai	—
<i>Prawns</i>	Prawns	Chingri	Segadichotia, Etti.	Chennusen, Konchu.	—	Yera	Gorasalu,
<i>Crabs</i>	Crabs	Kankara	Aedi	Nandu	Khehra	—	Gorakali.
						Nandu	Boryalu
						Pitha	—
							Kankads (Orissa).

\* A kind of carp is called “Bhangan” in the Punjab.

**APPENDIX I—contd.**

*Commercially important fishes with their scientific, popular and the more common Indian names—contd.*

(ii) Freshwater fishes.

Name of fish.	Popular names (English).	Assamese.	Bengali.	Hindi.	Marathi.	Oriya.	Punjabi.	Sindi.	Tamil.	Telegu.	Special names in certain regions. (The name of the locality given within brackets etc.)
<i>Anguilla bengalensis.</i>	Eel	—	—	—	Ahir	—	—	—	Serampam-bn. Vellangoo	—	Sais, Cuchia (Chittagong).
<i>Walleago attu</i>	Freshwater shark.	Poil, Barali	Boyal, Keyali.	Boalee, Parin, Lanchi.	Shivada, Pari, Purram.	—	Muley	Poitee-Mulla, Jerikee.	Valei, Tele.	Wallagh	Sareng (Manipuri), Pains (Rohitak), Pattan (Hyderabad Dn.), Vals (Malabar), Vaghair (Parunes) Kheord (Poona).
<i>Eogerius yarrellii.</i>	Freshwater shark.	Baghmechh, Goreash.	Baghari	Boonch, Goonch.	Mitanda, Tharota.	Sahluu	—	—	—	Rahijellah	Maroof (Hyderabad Deccan), Pangas (Nathpur).
<i>Clarias magur</i>	Magur	—	Magur	Mangri	—	Maghurah	Kugga	—	—	Marpoo	—
<i>Pangasius buchanani.</i>	Pungas cat-fish.	—	—	Pungwas, Pungas.	Pariasi	—	Jellum	—	Kovail-Oolakeluthi, Kitchan.	Ponatti	Wanjou
<i>Silurus gangeticus.</i>	Silond cat-fish.	—	Silun, Dhaun.	Baitar, Banspati	—	Ji-lung	Silond	—	Qumboo-kelutti.	Multi-jelish Seengala	—
<i>Macromes senegalensis.</i>	Air-cat-fish	Air, Auri	Air, Aor	Ari, Pogai	Singala, Singhata.	Ali	Addi	Chaiya, Shingas, Singnaree.	Chellie	Jhali, Dhuan, Basiki.	Tonger, Teagan (United Provinces).
<i>Autopichthys vaeha.</i>	Butchwa	Becha, Bassa	Vacha	—	Sugwab-ohoya.	—	Butchwa, Nandi-butchwa.	—	—	Tunti, Onguwa (Lakshmi-pur), Katis (Purnea).	

Notopterus chitala.	Feather-back.	Seerul Kandla.	Chital	Mohi	—	Chital, Puli.	Pari, But, Moh.	Gundun	Ambutan-wahish-Sethakondai.	—	Chappal maoche (Hyderabad Dn.) Wallak-tait a h (Mysore), Karimeen, Pal-lathi. (West coast). Malan (Malabar),
Etroplus suratensis.	Pearl spot.	—	—	Pitni-kas	—	Cundahla	—	Pitullas	Uduppatti.	—	Kochiina-Muri (Canare), Wrah (Malabar).
Mugil corsicus.	Mullet	Keaki	Eliangs, Arwari, Igeese, Shol.	Undals, Andvari.	—	Kakunda	Hurdwahre	—	Karsar,	—	Undeo-colees (Malabar).
Ophiocephalus striatus.	Snake-head ed fish.	Shawl* Gojhal.	Murrul, Sowra, Dherimuri.	Dakhu	Sola	Dhoalee, Carrodah.	Charkoor	Veralu, Carrup-veralu.	Sowarh	—	Kochiina-Muri (Canare), Wrah (Malabar).
Anabas scandens	Climbing perch.	Kai, Khayi	Coi, Corvu	Kobhai	—	—	—	—	Panieri-kendal, Sennal, Teli	—	—
Saccobranchus fossilis.	—	Singi, Shini	Singhi	Bitchu-ka-Machi.	Singee	Noor-i-e	Lohar	—	—	—	—
<i>Labeo rohita</i> .	Rohu	Rohit, Rui	Ruee	Rohu	Tambada-massa.	Ruhu	Pohn, Tapra, Dhambra, Dhai, Kala-han, Di.	Dihee	—	—	Dei (Cutch) Rohu (Hyderbad Deccan) Kuri-meanu (Cana-para), Tambre (Cutch).
<i>Labeo calbasu.</i>	Kanoshi	Mahlee, Kaliara.	Kalabasu, Kunda.	—	Kanoshi	Kala-Beinse	—	—	Nalla-gandu-meenu.	—	—
Catla-ostia buchanani.	Catla	Bau, Dhak-ers.	Catla	Chepti, Catla, Boessa.	—	Bhakura	Theils, Theil.	Taylee	Theppi-peen.	—	—
Mrigal-Cirrhinus mirigala.	Hamilton's Carp.	Mirka, Mirga.	Mrigala	Naini, Mrigala.	Mirgha	Mirgali	Mori, Morakha, Naraini.	Mor-ah-lee	—	—	—
Barbus-Barbus tor.	Mahaseer	Bura patra, Junurs peetina.	Puntior	Naharn	Kajra	Khadchi, Masta, Mabsala.	Kureah, Potia.	Kendi, Bonin.	Pedha-polika.	H a 11 a-min a (Mysore) Mer-uvul (Malay-alam).	
Prawns	Prawn	—	Chingri	—	—	—	—	—	Yers	Roysalu	Gingah (Deccan), Koneja (Cochin).
Crabs	Crab	—	—	—	Kekla	Kankada	—	—	Nandu	Pitha	—

\*Young ones are called Latta.

## Marine and Back-

Type of fishing implements.	Sind area.	Gujarat area.	Konkan area.	North Canara area.	South Canara area.	Malabar Coast area.
I. Fixed or Stationary nets.	Dora, Rachh net, Dar-bando.	J a d i jal, Magh.	W a g h u r (budi ch i) Asu, Kavi, Do.	Zangad, wa-gh jal, Ph a n s a jal, Zan-gada jal, Bang a d a jal.	Gorati ba-lai, Endi balai.	..
II. Bag nets and Purse nets.	..	G h o l w a, Dol.	G h o l w a, Bhoksi jal, jot.	Maribale	Vai balai (nulu ba-lai, mari balai).	Kurukku madi.
III. Seine nets	Pakhi, Rebi, Dak.	Jal, Tare-sar, Faro-da (achho-da).	Tirgan, Rac-si, Adit Dhangda.	..	..	Odam vala (Peru vala, Paithu vala) Vakkuvala, Kolli vala.
IV. Drift and gilling nets.	Rachh	Jal, Kenda-ri.	Vavdi (vav-ri), Bhi-shi (nahi).	Vavri, Mag, Beed net.	Khan d a d i balai, Acha balai, Aib-urla balai, Sho raku balai, Pat-ti balai, Kanda ba-lai.	Kha ndadi vala, Odu vala, Na-riyan vala, Sravu vala, Thiran-di vala, Aiylachala vala, Mathi chala vala, Kai-vala, Mu pp in vala.
V. Inshore Drag nets	Dak Luyen, Jar.	Bandh jal	Rampani	Payodha	Rampani	Koru vala
VI. Cast nets	Jari	Mang, Cho-gia.	Pag, Kakani pag, Pagli.	Shendi	Deb balai (many names).	Vichu vala (many different names, but collectively called "Vi-chu vala"), Kattum vala, (Stringless cast net).

**Part II.**  
**different fishing areas in India.**  
 various localities are given.)

water Fisheries.

Riverine and Lacustrine

South Canara and Malabar (back-waters)	Gulf of Mannar area.	Coromandel Coast area.	Coromandel Coast back- waters.	Telegu area.	Deltaic area.	Gangetic system of rivers, etc.	Indus system of rivers, etc.
Valu Vala, (u n ni ku- tha vala) Endi valai	Kalamkatti valai.	..	Kala valai, Kattu va- lai.	..	..	..	Nilo t u (pan d), Nara.
Ch a v i t t u vala, sult- tan vala, vatta vala.	..	Mada valai, (Mara va- lai, Nida valai, Ye- da valai, K a m b i v a l a i), Thuri va- lai, E r u valai Chenna- Kunnii valai, Mullu valai.	..	Pedda valai, Iraga va- lai, Katta valai, Ka- vala valai, Nida valai, Mapu valai, " Ali v i " valai.	Suti jal, Bada jal.	Kharki jal, Shanla jal.	..
Panthi vala	Vangu valai	Kola valai, Ko d a v a valai, Thiva valai, Valla valai, Ku- zhi valai.	..	Bada jal, E n d u l a jal, Sanna valai.	Ber jal, Ko- chal jal (dingi jal, Jangli jal).	Kona jal	..
Kola vala, Shamku valai.	Vala valai, Kola valai.	Vala valai, Kanni va- lai, Thir- ukkai va- lai, Kottu valai.	Kala valai, Ko du va valai.	Beckti jal, Patna jal, Pusain a i- kanni valai	Chandi jal, K a r a l (Katla jal), F eripetar, Dangi.	..	..
Vadi vala, Ola vala, Telli kanni vala, Pet- tuk a nni vala.	Ola valai, Kara val- lai, Otta valai.	Perla vala	Konda valai	Noli .	..	..	B h i g a (Kadh, k u r g a, chatta, a n d ma ha jal).
Vichu vala	..	Vichu valai (a general name for cast-nets).	Vicha valai.	Khape jal, Kadhi jal.	Khepla jal, Bechari jal (othar jal).	Khepla jal, Bechari jal (othar jal.)	S o r r u Werru Doba- jiu, Palki, Sot- wan.

APPENDIX  
*The chief fishing methods used in the  
 (The Indian names current in the*

Type of fishing implements.	Marine and Back-					
	Sind area.	Gujarat area.	Konkan area.	North Canara area.	South Canara area.	Malabar Coast area.
VII.—Scoop nets	Yedi ..	..	Gada ..	..	..	Arippo vala (Vettu vala).
VIII.—Pouch trap	..	..	..	..	..	..
IX.—Trawl type nets.	..	..	..	..	..	..
X.—Miscellaneous—						
(a) Long lines	Practised	Practised	Practised	Practised	Cheria beppu, Valia beppu.	Cheria beppu Valai beppu or Srava beppu.
(b) Harpoon	..	..	..	..	..	Chattull.
(c) Fish spears	..	..	..	..	..	..
(d) Fish screens	..	..	..	..	..	..
(e) Fish traps	..	..	..	..	..	..
(f) Baited spring	..	..	..	..	..	..
(g) Angling	Practised	Practised	Practised	Practised	Practised	Practised

NOTE.—1. In the Gulf of Mannar area

2 Names of similar nets are

DIX II.—concl'd.  
different fishing areas in India.  
various localities are given.)

water Fisheries.

Riverine and Lacustrine.

South Canara and Malabar (back-waters)	Gulf of Mannar area.	Coromandel Coast area.	Coromandel Coast back- waters.	Telegu area.	Deltaic area.	Gangetic system of rivers, etc.	Indus system of rivers, etc.
Kai valai ("Hand net"), Che- ena vala or Kambu vala (Chinese dip net).	Seepu valai	Kai valai	A scoop net in use.	..	..	Hela jal, Kharra jal, Bhesal jal, Kolla jal (Korsula jal).	Kochhi, Dang- la, Kurili, Seg- gan.
..	..	..	Iriga valai	Siru valai	..	..	..
..	Madi valai	..	..	..	Moi jal	..	..
..	Practised	Practised	Tamani Kayaru.	Practised	Practised, Borshi.	..	Lang (dor) Dor.
Chattuli	..	..	..	..	..	Ek-katya	..
Thumbi- than Per- angi pathi.	..	..	..	..	..	Konoh	..
Kurithi pari.	Avolia	..	..	Salwa pulti.	..	Chachi patil.	..
Kudu and ottal.	Kudu	..	..	..	..	Polo tapoo.	Chipp.
..	..	..	..	..	..	Barra (Datia).	..
Kaichoonda	Practised	Practised	Practised	Practised	Practised	Practised	Bansi (Birhi, cheep).

"Whiffing" is practised.  
given within brackets.

## APPENDIX III.

Statement showing the quantities of sea fish landed in the different coastal areas arranged according to varieties.

(In thousands of maunds.)

Name of the group.	Baluchistan Coast.	Sind Coast.	Kashiawar Coast.	Bombay Coast.	Madras West Coast.	Cochin Coast.	Travancore Coast.	Madras East Coast.	Orissa Coast.	Bengal Coast.	Total.
1. Elasmobranchs . . .	19	14	20	182	79	11	108	40	15	12	500
2. Eels . . .	..	2	1	26	..	..	1	Neg.	..	..	30
3. Cat-fishes . . .	5	10	9	105	69	1	64	29	21	30	343
4. Dorab or silver-bar fish	4	..	..	40	1	..	Neg.	25	..	11	81
5. Herrings and Anchovies.*	..	30	12	137	1,072	60	870	762	66	971	3,970
6. Bombay Duck . . .	..	..	10	161	..	..	..	16	12	9	208
7. Mackerels and perches	32	17	15	282	577	102	949	412	22	127	2,535
8. Silver-bellies . . .	..	..	..	13	155	19	50	76	..	..	313
9. Pomfrets . . .	..	10	6	80	5	..	11	32	21	17	182
10. Flat-fishes . . .	14	20	..	9	151	31	1	Neg.	..	40	266
11. Mullets . . .	..	15	9	38	Neg.	..	10	41	23	30	166
12. Indian salmon . . .	11	5	2	44	1	..	..	9	40	75	187
13. Jew fishes . . .	..	13	8	107	19	..	92	170	20	9	438
14. Crustaceans . . .	..	50	4	66	82	243	249	65	55	346	1,160
15. Minor shell fishes . . .	..	3	..	13	..	..	..	Neg.	3	44	63
16. Miscellaneous . . .	7	9	4	59	686	159	184	102	5	9	1,224
Total . . .	92	198	100	1,362	2,897	626	2,589	1,769	303	1,730	11,666

## APPENDIX IV.

Table showing the estimated marketable surplus of freshwater fish in India.

(In thousands of maunds.)

	Assam.	Bengal.	Bihar.	Bombay.	C.P. and Berar.	Madras.	Orissa.	Sind.	U.P.	Other Provinces.	Baroda.	Hyderabad.	Jammu and Kashmir.	Travancore.	Other States.	India.
Cat-fishes . . .	256	1,084	342	11	45	40	113	37	47	6	2	4	10	13	34	2,044
Mullets . . .	251	19	10	..	..	19	26	32	..	14	4	6	..	10	10	380
Carp . . .	290	999	355	33	52	55	104	109	59	1	5	2	1	10	42	2,148
Prawns . . .	36	219	48	19	11	21	23	62	1	2	2	5	..	11	12	471
"Live" fishes . . .	81	329	67	3	15	23	34	9	25	2	1	5	..	7	16	616
Feather-backs . . .	41	157	38	3	..	12	16	11	5	2	1	2	..	2	4	294
Eels . . .	31	5	1	5	2	3	3	..	..	Neg.	..	..	..	1	2	53
Herrings and Anchovies.*	..	..	24	..	..	..	..	..	..	..	..	..	..	..	..	24
Miscellaneous . . .	18	63	62	1	28	15	7	4	10	..	..	2	3	12	6	231

\*Hilsa being a marine and estuarine fish is included in Appendix IV although its fishery is mainly in freshwaters during the flood season.

APPENDIX V.

Proportion of the total catch of eight economic groups of sea-fish landed along 5 stripes of Indian coast-line.

Variety and Coast.	Total production (in thousands of maunds).	Distribution over the months. (Expressed as percentages to the total catch during the year.)									
		January.	February.	March.	April.	May.	June.	July.	August.	September.	October.
<b>1. <i>Eleotriidae</i>—</b>											
(a) Sind-Kathiawar Coast	34	20.4	14.8	8.4	7.2	6.0	1.2	..	..	12.4	12.8
(b) Bombay Coast	182	20.2	12.1	9.6	8.3	..	..	..	0.9	8.9	11.9
(c) South West Coast	198	6.9	7.9	7.2	6.9	6.2	2.5	4.1	9.1	16.3	19.7
(d) South East Coast	40	5.9	7.7	10.3	8.4	8.6	10.3	10.6	9.8	10.3	10.3
(e) Orissa-Bengal Coast	27	13.1	4.1	7.0	6.2	3.6	6.9	8.3	8.5	9.2	4.5
<b>2. <i>Cat-fishes</i>—</b>											
(a) Sind-Kathiawar Coast	19	20.5	14.8	12.7	7.8	5.7	1.6	..	..	1.3	8.8
(b) Bombay Coast	105	19.8	12.9	9.8	9.8	8.0	..	..	4.0	10.0	16.6
(c) South West Coast	134	3.6	3.1	2.4	12.8	9.8	7.5	7.3	12.7	9.1	14.2
(d) South East Coast	29	9.7	10.8	14.3	11.9	6.1	10.6	6.5	3.6	12.8	12.4
(e) Orissa-Bengal Coast	51	13.4	7.8	5.6	4.9	2.5	3.3	3.7	1.6	5.4	10.3
<b>3. <i>Herrings and Anchovies</i>—</b>											
(a) Sind-Kathiawar Coast	42	2.8	26.6	28.8	7.2	1.5	1.4	2.8	4.2	7.8	8.5
(b) Bombay Coast	137	9.3	8.5	7.0	7.0	8.5	2.3	2.3	3.0	4.5	12.6
(c) South West Coast	2,002	7.3	1.7	1.3	0.8	0.5	0.2	0.8	11.2	10.0	26.2
(d) South East Coast	752	16.5	12.5	10.3	12.7	6.1	5.2	2.6	1.3	2.8	5.8
(e) Orissa-Bengal Coast	1,037	5.0	6.3	7.3	8.3	8.7	18.9	23.5	9.4	4.9	3.1
<b>4. <i>Mackerels and Perches</i>—</b>											
(a) Sind-Kathiawar Coast	32	12.8	9.7	4.5	2.6	0.6	1.6	2.8	6.3	9.4	16.4
(b) Bombay Coast	282	9.0	8.6	7.3	1.1	1.1	1.5	2.2	3.3	9.5	21.3
(c) South West Coast	1,028	8.8	3.0	2.1	1.5	0.7	2.4	9.2	17.7	25.7	13.3
(d) South East Coast	412	10.4	15.3	3.7	4.9	6.0	6.7	9.8	8.7	15.2	8.5
(e) Orissa-Bengal Coast	149	14.2	13.0	5.7	4.3	2.4	3.0	2.8	3.5	10.4	15.6

APPENDIX V—contd.

Proportion of the total catch of eight economic groups of sea-fish landed along 5 strips of Indian coastline—contd.

Variety and Coast.	Total production (in thousands of maunds).	Distribution over the months. (Expressed as percentages to the total catch during the year.)									
		January.	Febr.	March.	April.	May.	June.	July	August.	September.	October.
<b>5. Pongrels—</b>											
(a) Sind-Kathiawar Coast	16	13.1	8.1	5.0	1.3	..	..	..	2.5	28.7	22.5
(b) Bombay Coast	80	9.1	5.9	4.0	3.5	..	..	..	1.3	26.3	26.4
(c) South West Coast	16	6.3	2.7	7.2	15.5	7.9	14.9	15.3	9.8	10.1	2.3
(d) South East Coast	32	1.4	4.5	4.7	12.2	6.0	9.2	13.5	19.5	4.2	2.0
(e) Orissa-Bengal Coast	38	7.3	6.2	4.0	5.9	4.3	5.8	9.8	11.2	9.5	3.5
<b>6. Mullet—</b>											
(a) Sind-Kathiawar Coast	24	4.3	3.3	2.9	1.2	1.9	5.0	11.2	18.6	15.0	11.9
(b) Bombay Coast	38	1.8	1.8	1.8	1.8	1.8	12.2	21.3	22.7	19.5	4.5
(c) South West Coast	10	4.8	2.4	3.7	4.0	5.4	17.2	40.8	4.8	7.7	4.3
(d) South East Coast	41	4.3	9.0	12.6	5.4	10.3	12.7	6.1	7.4	6.3	1.4
(e) Orissa-Bengal Coast	53	8.9	7.4	4.8	2.2	6.5	6.1	2.6	0.9	6.7	11.4
<b>7. Jow Fishes—</b>											
(a) Sind-Kathiawar Coast	21	20.0	12.3	6.0	4.4	1.1	0.8	0.4	..	5.4	13.5
(b) Bombay Coast	107	11.5	9.3	9.2	7.4	5.4	3.1	3.1	3.1	3.3	14.9
(c) South West Coast	111	5.6	7.8	5.6	0.2	0.4	2.1	11.7	12.5	35.3	8.7
(d) South East Coast	170	3.6	6.8	8.6	9.1	5.9	7.8	13.1	8.6	14.4	7.5
(e) Orissa-Bengal Coast	29	6.8	6.6	7.0	6.1	4.1	5.5	9.3	6.0	12.0	11.6
<b>8. Crustaceans—</b>											
(a) Sind-Kathiawar Coast	54	23.7	11.4	2.9	..	0.3	0.3	0.4	0.7	0.8	10.3
(b) Bombay Coast	66	1.8	1.4	1.4	2.0	2.9	3.8	4.7	9.4	13.8	17.4
(c) South West Coast	574	10.8	17.4	11.3	9.1	7.1	11.5	10.8	3.6	3.5	3.0
(d) South East Coast	65	9.1	11.5	11.4	3.1	9.1	14.6	7.6	13.8	3.4	2.2
(e) Orissa-Bengal Coast	401	21.7	17.8	10.4	8.5	2.4	5.3	4.4	5.5	4.8	10.6

## APPENDIX VI.

Trend of production of fresh sea-fish in the West-coast of Madras Province.

(In thousands of maunds.)

	Elasmobranchs.	Cat-fishes.	Herrings and the Anchovies.	Mackerels and perches.	Pomfrets.	Silver-bellies.	Flint-fishes.	Jew fishes.	Prawns.	Miscellaneous.	Total.
1929-30	102.0	35.3	117.8	2,233.0	6.5	178.4	77.4	23.7	141.7	341.7	3,257.5
1930-31	85.6	70.0	244.1	347.8	15.7	97.0	172.7	23.1	186.1	404.3	1,646.4
1931-32	110.2	91.6	93.5	4,067.3	7.1	129.6	267.6	52.0	223.0	367.7	5,409.6
1932-33	88.0	51.5	127.8	2,190.9	13.5	30.7	82.5	19.7	101.8	418.0	3,133.4
1933-34	71.4	83.3	2,015.7	671.1	9.0	48.1	92.9	10.7	139.8	254.8	3,396.8
1934-35	87.1	56.9	79.1	1,476.2	4.7	110.2	153.8	39.8	152.9	299.8	2,460.1
1935-36	88.0	125.5	70.1	2,359.2	48.2	99.5	115.9	19.2	141.1	299.1	3,366.2
1936-37	116.2	194.4	788.5	1,222.6	9.1	77.1	116.9	71.9	149.5	435.5	3,180.9
1937-38	126.8	283.0	552.2	407.5	9.9	76.3	100.2	64.0	107.9	678.8	2,468.1
1938-39	106.4	89.8	176.8	788.7	14.6	113.5	112.4	61.1	60.5	477.7	2,001.5

## APPENDIX VII.

Certain particulars regarding fish supply at a few important places in India.

Place.	Total amount of fresh fish now available (in maunds).	Particulars regarding varieties, seasons of availability, etc.
Karachi city	255,000	Crustaceans 24.6 % (Oct. to Feb.); Carps 15.6 % (Oct. to Feb.); Herrings and the Anchovies 9.4 % (Feb., March, April); Mullets 9.3 % (all thro., peak Sept. to Dec.); Mackerels and perches 5.3 % (Sept. to March); Cat-fishes 5.3 % (Oct. to Feb.); Pomfrets 3.1 % (Oct. to Feb.); Indian salmon 1.6 % (June to Oct.).
Baroda city	3,000	Carps 33.4 % (good supply all thro., peak Oct. to Jan.); Prawns 23.5 % (all thro.); Mullet 10.8 % (all thro. Max. from Sept. to March); Cat-fishes 10.6 % (all thro., Max. between Dec. and July); Indian salmon 4.0 % (Dec. to April).
Bombay city	290,000	Bombay Duck 29.5 % (all thro., Max. between June and Nov.); Mackerels and perches 9.8 % (Sept. to Feb.); Crustaceans 9.8 % (all thro., Max. Aug. to Dec.); Elasmobranchs 8.6 % (Nov. to March); Pomfrets 8.6 % (Oct. to March); Jew fishes 8.0% (all thro., Max. between Oct. and Jan.); Indian salmon 3.1 % (all thro.); Beckti 2.2 % (all thro.).
Malvan (Ratnagiri Dt., Bombay Province.)	101,000	Mackerels and perches 35.0 % (Sept. to March); Herrings and the Anchovies 27.6 % (all thro., except July, Aug., Sept.); Elasmobranchs 10.0 % (Oct. to May); Cat-fishes 7.6 % (Oct. to May).
Malpe (South Canara Dt., Madras Province.)	182,000	Mackerels and perches 30.0 % (Oct., Nov., Dec.); Herrings and the Anchovies 25.0 % (Oct., Nov., Dec.); Soles 5.0 % (Sept.); Crustaceans 4.0 % (June to Aug. and Feb.); Cat-fishes 4.0 % (Oct. to March); Elasmobranchs 3.0 % (Aug., Dec.).
Mangalore (South Canara Dt., Madras Province.)	38,000	Mackerels and perches 20.0 % (Oct., Nov., Dec.); Herrings and the Anchovies 30.0 % (Oct., Nov., Dec.); Soles 13.2 % (Sept., Oct.); Cat-fishes 10.3 % (Oct. to March); Elasmobranchs 5.0 % (Aug. to Dec.).
Calicut (Malabar Dt., Madras Province.)	80,000	Mackerels and perches 21.5 % (Sept. to Feb.); Herrings and the Anchovies 14.8 % (Oct., Nov., Dec.); Soles 11.7 % (Sept.); Cat-fishes 10.4 % (March, April, May).

## APPENDIX VII—contd.

Certain particulars regarding fish supply at a few important places in India—contd.

Place.	Total amount of fresh fish now available (in maunds).	Particulars regarding varieties, seasons of availability, etc.
Tanur . . (Malabar Dt., Madras Province.)	194,000	Herrings and the Anchovies 20·0 % (Oct., Nov., Dec.); Mackerels and perches 15·0 % (Sept. to Dec.); Soles 13·2 % (Sept., Oct., Nov.); Silver-bellies 12·4 % (May, Aug., Sept., Oct.); Cat-fishes 8·2 % (March, April, May); Elasmobranchs 6·0 % (Aug. to Dec.); Prawns 5·0 % (Aug. to Feb.).
Narakkal . . (Cochin State.)	25,000	Crustaceans 38·8 % (all thro., Max. from Dec. to April); Mackerels and perches 16·3 % (Sept. to Feb.); Herrings and the Anchovies 9·6 % (all thro., except May and June); Flat-fishes 5·0 % (Aug., Sept., Oct.).
Vizhingom . . (Travancore State.)	40,000	Mackerels and perches 36·7 % (all thro., Max. from July to Jan.); Herrings and the Anchovies 33·6 % (all thro., Max. between Aug. and Jan.); Crustaceans 9·6 % (all thro., Max. between Feb. and Sept.); Elasmobranchs 6·0 % (all thro., peak from Aug. to Nov.).
Kolachel . . (Travancore State.)	29,000	Mackerels and perches 30·0 % (all thro., Max. from July to Jan.); Herrings and the Anchovies 25·0 % (all thro., Max. between Aug. and Jan.); Crustaceans 12·0 % (all thro., Max. between Feb. and Sept.); Elasmobranchs 6·0 % (all thro., peak from Aug. to Nov.).
Tuticorin . . (Tinnevelly Dt., Madras Province.)	8,000	Chirocentrus dorab 32·2 % (all thro., Max. between Jan. and July); Mackerels and perches 30·4 % (good supply all thro.) Herrings and the Anchovies 14·6 % (Sept. to April); Jew fishes 8·9 % (Nov. to March).
Madras city . .	150,000	Crustaceans 25·3 % (all thro., Max. Jan. and Feb.); Mackerels and perches 24·0 % (all thro., Max. Jan., Feb. and Sept.); Herrings and the Anchovies 10·0 % (all thro.); Silver-bellies 6·5 % (all thro.); Mullets 4·3 % (all thro., Max. Feb. and March); Elasmobranchs 2·7 % (all thro.); Pomfrets 1·2 % (all thro., Max. Aug. and Sept.); Indian salmon 0·4 % (all thro.).
Uppada . . (Rajahmundry Dt., Madras Province.)	49,000	Jew fishes 42·0 % (all thro., except April and May); Herrings and the Anchovies 33·2 % (Jan. to March); also caught pomfrets during March, Prawns during all months except May to July and Mackerels and perches from May to Sept.)
Gopalpur . . (Ganjam Dt., Orissa Province.)	19,000	Herrings and the Anchovies 22·0 % (all thro., Max. between March and Sept.); Prawns 18·0 % (all thro., Max. Feb. to Sept.); Indian salmon 13·2 % (all thro., Max. Sept., Oct. and Feb. to May), Mullets 7·5 % (all thro.); Mackerels and perches 7·4 % (July to Nov.); Pomfrets 7·0 % (all thro., Max. July to Sept.); Cat-fishes 7·0 % (all thro., Max. Nov. to Jan.).
Kaluparghat . . (On the Chilka Lake, Orissa Province.)	14,000	Mullets 25·0 % (all thro.); Prawns 20·0 % (Feb. to Sept.); Indian salmon 10·0 % (Sept. to May); Herrings and the Anchovies 5·0 % (March to Sept.); Mackerels and perches 5·0 % (July to Nov.).
Calcutta city . .	548,000	Cat-fishes 25·0 % (Sept. to March); Carps 22·0 % (Oct. to March, Max. Dec. to Feb.); Herrings and the Anchovies 17·0 % (all thro., Max. June to Aug.); Prawns 11·0 % (all thro., Max. Dec. to April); "Live" fishes 7·5 % (all thro., Max. Nov. to Feb.); Mullets 6·0 % (all thro., peak in cold months); Feather-backs 3·5 % (all thro., peak in cold months); Indian salmon 1·3 % (Sept. to March).
Delhi . .	11,400	Carps 40·0 % (all thro., except Aug. to Oct.); Cat-fishes 25·0 % (all thro., except Aug. to Oct.); Pomfrets 7·4 % (Nov. to Feb.); Herrings and the Anchovies 4·9 % (Nov. to Feb.); Crustaceans 3·9 % (Nov. to Feb.); Mackerels and perches 3·4 % (Nov. to Feb.).
Jubbulpore . . (Central Province.)	3,000	Carps 46·0 % (all thro., Max. July to Jan.); Cat-fishes 28·0 % (all thro.); "Live" fishes 8·0 % (all thro., Max. July); Crustaceans 4·0 % (all thro., Max. June and July).
Lahore . .	5,600	Prawns 24·0 % (all thro., Max Oct. to March); carps 20·0 % (Oct. to March); Herrings and the Anchovies 8·0 % (Oct., Nov.); Cat-fishes 7·0 % (Oct. to March); Mullets 6·0 % (Oct. to March); Flat-fishes 5·0 % (all thro.); Pomfrets 2·5 % (all thro.).

## APPENDIX VIII.

### *Imports of fish products into India.*

APPENDIX IX

### Periodicity of imports:

(Average for 5 years ending 1940-41.)

APPENDIX X.

*Countries consigning cod-liver oil and fish manure for import into India.*

(Percentage to total by weight.)

Name of country from whence imported.	1935-36.			1936-37.			1937-38.			1938-39.			1939-40.			Quinquennial average.	
	Cod-liver oil.	Fish manure.															
Empire countries—																	
United Kingdom	14.3	—	15.8	—	20.5	—	21.6	—	24.5	—	20.2	—	20.2	—	20.2	—	20.2
Other British possessions	—	—	—	—	0.3	—	Neg.	—	—	—	Neg.	—	Neg.	—	Neg.	—	Neg.
Total	14.3	4.0	15.8	1.8	20.8	0.2	21.6	1.4	24.5	0.1	20.2	1.3	20.2	1.3	20.2	1.3	
Foreign countries—																	
Norway	74.0	—	68.5	—	67.6	—	68.1	—	63.5	—	67.1	—	67.1	—	67.1	—	67.1
Germany	3.8	—	6.5	—	3.6	—	5.4	—	3.0	—	4.5	—	4.5	—	4.5	—	4.5
Netherlands	0.9	—	2.7	—	2.1	—	4.0	—	3.9	—	3.2	—	3.2	—	3.2	—	3.2
United States of America	0.7	—	1.8	—	4.3	—	2.4	—	2.4	—	2.4	—	2.4	—	2.4	—	2.4
Muscat Territory and Trucial Oman.	—	79.4	—	88.8	—	99.5	—	93.4	—	84.3	—	89.3	—	89.3	—	89.3	—
Other Native States in Arabia	—	2.2	—	6.5	—	—	—	—	—	—	—	—	—	—	—	—	—
Iran	—	14.4	—	2.9	—	0.3	—	5.2	—	12.9	—	6.9	—	6.9	—	6.9	—
Other foreign countries	—	6.3	—	4.7	—	1.6	—	0.5	—	2.7	—	2.6	—	2.6	—	2.6	—
Total	85.7	96.0	84.2	98.2	79.2	98.8	78.4	98.6	76.5	99.9	79.8	98.7	98.7	98.7	98.7	98.7	98.7
Total quantity imported	Cwt.	904	29,580	1,669	52,320	1,473	35,660	2,505	46,980	1,968	49,900	1,703	42,906	1,703	42,906	1,703	42,906
Total value of imports	Rs.	41,170	1,12,846	77,752	1,73,313	92,717	62,529	1,33,654	72,538	1,65,337	96,711	1,02,136	1,01,929	1,02,136	1,01,929	1,02,136	1,01,929

APPENDIX XI.

Exports of fish products from India.\*

194

Fish, dry, unsealed.				Fish, dry, salted.				Fishmaws and shark fins.				Fish, wet, salted.				Total preserved fish.			
Quantity.	Per cent. to total imports.	Cost per cwt.	Per cent. to total imports.	Quantity.	Cost per cwt.	Per cent. to total imports.	Cost per cwt.	Quantity.	Per cent. to total imports.	Cost per cwt.	Per cent. to total imports.	Quantity.	Per cent. to total imports.	Cost per cwt.	Per cent. to total imports.	Quantity.	Per cent. to total imports.	Cost per cwt.	
Cwt.	Rs. A. P.	Cwt.	Rs. A. P.	Quantity.	Cost per cwt.	Per cent. to total imports.	Cost per cwt.	Quantity.	Per cent. to total imports.	Cost per cwt.	Per cent. to total imports.	Quantity.	Per cent. to total imports.	Cost per cwt.	Per cent. to total imports.	Quantity.	Per cent. to total imports.	Cost per cwt.	
1936-37	212,418	53.7	20 13 3	174,545	44.1	17 7 9	4,216	1.1	106 10 1	4,195	1.1	7 16 11	395,404	(100)	20 2 3	194	20 6 7	Rs. A. P.	
1937-38	208,076	61.6	19 8 6	121,292	35.8	18 15 7	5,066	1.5	99 6 11	4,000	1.2	9 7 3	328,524	(100)	20 6 7				
1938-39	205,193	61.1	20 13 10	119,592	35.6	17 7 9	5,939	1.8	86 10 9	5,224	1.6	8 0 4	335,968	(100)	20 9 11				
1939-40	201,732	56.4	20 0 10	142,291	39.8	16 4 0	6,233	1.8	86 10 9	7,246	2.0	10 1 11	357,502	(100)	19 8 0				
1940-41	171,704	49.6	22 1 4	150,216	43.4	12 15 9	7,690	2.2	63 9 8	16,213	4.7	5 2 1	345,832	(100)	18 4 2				
Quinquennial average.	198,824	56.5	20 10 9	141,587	39.7	16 10 1	5,840	1.7	88 14 2	7,394	2.1	8 2 3	354,643	(100)					

\* Excludes exports through Kathiawar ports.

APPENDIX XII.

Periodicity of exports.

(Average for five years ending 1940-41.)

	Fish, dry, unsalted.		Fish, dry, salted.		Fishmaws and shark fins.		Fish, wet, salted.		Total preserved fish.	
	Quantity exported.	Percentage to annual total.	Quantity exported.	Percentage to annual total.	Quantity exported.	Percentage to annual total.	Quantity exported.	Percentage to annual total.	Quantity exported.	Percentage to annual total.
	Cwt.	Cwt.	Cwt.	Cwt.	Cwt.	Cwt.	Cwt.	Cwt.	Cwt.	Cwt.
January	16,060	8.2	14,658	11.0	492	7.9	3,304	40.3	34,514	10.0
February	16,805	8.5	13,468	10.1	638	10.2	1,906	23.3	32,817	9.6
March	20,998	10.7	9,761	7.3	905	14.5	1,859	22.7	33,533	9.7
April	12,613	6.4	8,627	6.5	601	9.6	191	2.3	22,012	6.4
May	12,206	6.2	11,128	8.3	865	13.9	..	..	24,199	7.0
June	18,370	9.3	9,090	6.8	593	9.5	..	..	28,003	8.1
July	20,925	10.6	4,888	3.7	362	5.8	80	1.0	26,255	7.6
August	15,662	8.0	4,513	3.4	241	3.9	..	..	20,417	5.9
September	19,111	9.7	8,368	6.3	158	2.5	..	..	27,636	8.1
October	18,242	9.3	13,672	10.2	450	7.2	..	..	32,384	9.4
November	11,153	5.7	19,969	15.0	448	7.2	..	..	31,570	9.2
December	14,672	7.4	15,193	11.4	488	7.8	854	10.4	31,207	9.1
Total exports	196,767	(100)	132,335	(100)	6,541	(100)	8,194	(100)	344,537	(100)

*Average seasonal wholesale prices of the main groups  
(Per*

Name of the Group.	Karachi	Surat	Kalat	Arnella	Ratnagiri	North
	city.	district.	Arnella.	Revdanda.	district.	Canara
	Rs. A. P.					
Elasmobranchs . . . . .	5 8 0	4 8 0	5 0 0	6 0 0	3 9 0	3 0 0
Cat-fishes . . . . .	5 12 0	5 0 0	5 5 0	8 0 0	4 11 0	2 15 0
Dorab or Silver-bar fish . . . . .	..	5 4 0	7 8 0	8 2 0	4 8 0	4 12 0
Oil sardine . . . . .	7 8 0	..	..	5 0 0	3 8 0	2 15 0
Hilsa . . . . .	10 8 0	..	..	..	..	..
Anchovies . . . . .	5 6 0	4 12 0	5 0 0	4 12 0	2 0 0	1 14 0
Bombay Duck . . . . .	..	3 9 0	4 3 0	4 18 0	2 15 0	..
Mackerel . . . . .	..	..	..	5 10 0	3 9 0	3 0 0
Seer . . . . .	16 12 0	8 4 0	11 11 0	12 4 0	6 14 0	6 5 0
Beekti . . . . .	..	8 4 0	17 8 0	11 14 0	7 3 0	6 8 0
Pomfret . . . . .	11 8 0	6 11 0	10 15 0	11 15 0	6 8 0	5 0 0
Flat fishes . . . . .	17 14 0	4 14 0	7 8 0	7 8 0	5 0 0	2 0 0
Mullets . . . . .	12 12 0	6 6 0	10 0 0	10 0 0	5 11 0	3 0 0
Indian salmon . . . . .	17 8 0	6 4 0	12 4 0	11 14 0	6 11 0	6 0 0
Jew fishes . . . . .	14 8 0	6 6 0	7 8 0	8 0 0	4 4 0	3 12 0
Prawns . . . . .	10 4 0	5 12 0	5 5 0	5 15 0	3 7 0	3 5 0
Other shell fish . . . . .	12 8 0	4 0 0	5 8 0	4 12 0	..	..
Miscellaneous . . . . .	4 14 0	4 0 0	4 14 0	4 8 0	2 4 0	2 0 0

## XIII.

of sea fish in the chief producing areas.

maund.)

South Canara and Malabar Districts.	Cochin State.	Travancore State.	Tinnevelly District.	Chingelput and Nellore Districts.	Bezwada and Rajah- mundry Districts.	Orissa.	Bengal.
Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.
2 6 3	1 11 6	2 7 3	2 9 6	4 9 4	3 2 0	3 6 1	6 8 0
2 3 2	1 14 6	2 9 0	2 9 9	3 7 2	2 15 8	3 1 7	4 13 0
2 0 0	2 1 3	5 4 0	3 9 10	2 12 0	3 10 11	3 12 8	6 7 0
0 14 7	0 15 8	1 3 0	2 0 8	..	1 12 5	1 14 8	..
..	..	..	2 3 3	6 4 0	3 0 9	2 8 4	7 12 0
0 11 8	0 10 4	0 8 8	2 6 5	2 1 0	2 11 1	1 12 7	3 7 3
..	..	..	2 9 8	4 7 1	1 9 2	1 8 0	3 9 4
1 11 0	1 7 4	1 9 0	2 10 10	2 2 0	3 1 4	2 13 7	..
2 10 4	2 14 3	2 13 7	..	3 4 0	4 4 4	4 8 0	12 4 0
..	4 3 0	4 12 0	4 8 4	3 12 4	2 11 9	3 9 0	6 11 0
2 3 7	2 7 0	3 1 0	3 13 2	2 9 0	4 3 2	4 12 9	11 7 3
0 10 3	0 9 8	1 9 0	..	1 7 3	..	..	9 4 3
..	..	3 7 0	2 13 0	3 5 4	3 13 3	3 12 2	6 7 0
2 11 5	2 6 4	3 4 0	3 5 5	3 4 4	4 7 3	5 7 6	13 2 0
1 3 6	1 5 0	1 12 0	1 13 10	2 7 6	2 10 5	3 0 4	6 7 0
1 4 8	0 15 0	0 13 9	1 15 7	2 8 7	2 11 0	1 13 0	3 7 3
..	1 0 0	1 0 0	..	3 4 1	0 12 7	1 3 0	2 9 4
1 3 4	0 15 8	0 15 0	2 3 6	1 3 0	2 3 0	1 7 0	3 8 7

APPENDIX XIV.  
*Utilization of fish in India.*

108

Annual production.	Consumed as fresh fish.		Converted into sundried fish.		Converted into salted fish.		Converted into fish manure.*	
	Quantity.	Percentage.	Quantity.	Percentage.	Quantity.	Percentage.	Quantity.	Percentage.
			Maunds	Maunds	Maunds	Maunds	Maunds	Maunds
Sind	464,267	343,946	74.1	22,000	4.7	53,000	11.4	45,321
Bombay	1,442,200	101,226	7.0	453,000	31.4	335,000	23.2	562,974
Madras	4,853,793	611,490	12.6	1,609,000	33.2	1,405,000	28.9	1,228,303
Cochin	642,347	429,625	66.9	167,000	26.0	43,000	6.7	2,722
Travancore	2,663,731	909,689	34.1	410,000	15.4	1,342,000	50.4	2,042
Orissa	629,270	510,270	81.1	95,000	15.1	24,000	3.8	Neg.
Bengal	4,862,240	3,862,240	79.4	850,000	17.5	1,60,000	3.1	Neg.
Assam	721,606	656,606	91.0	50,000	6.9	15,000	2.1	Neg.
Baluchistan	92,562	43,702	47.2	15,320	16.6	19,930	21.5	13,610
Bihar	959,456	956,606	99.7	2,850	0.3	Neg.	Neg.	Nil
United Provinces	147,000	145,089	98.7	Neg.	Neg.	Neg.	1,911	1.3
Kashmir	110,670	83,954	75.9	20,000	18.0	1,000	0.9	5,716
Central Provinces	156,000	156,000	100	Neg.	Neg.	Neg.	Neg.	Neg.
Punjab	33,000	33,000	100	Neg.	Neg.	Neg.	Neg.	Nil
Mysore	10,271	8,083	78.7	2,188	21.3	Nil	Nil	Nil
Hyderabad	20,000	17,700	88.5	2,300	11.5	Neg.	Neg.	Nil
Other areas	116,604	99,104	85.0	15,000	12.9	2,500	2.1	Neg.
<b>Total India</b>	<b>17,925,017</b>	<b>8,968,330</b>	<b>50.1</b>	<b>3,713,658</b>	<b>20.7</b>	<b>3,390,430</b>	<b>18.9</b>	<b>1,852,599</b>
								<b>10.3</b>

Neg.—Negligible.

\*Excludes manure produced from waste products, e.g., prawn shells, etc.

## APPENDIX XV.

*Seasonal average wholesale prices of the main groups of fresh water fish in producing areas.*

(Per manu.)

\*For Baroda city only.

for Jubbulpore only.

## APPENDIX

*Average monthly wholesale prices of salt cured fish in  
(Rupees per*

		S H A R K S .				C A T - F I S H E S .			
		Malapala-yam.	Parama-kudi.	Oratha-nad.	Dowlesh-waram.	Malapala-yam.	Parama-kudi.	Oratha-nad.	Dowlesh-waram.
		Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.
May	1940	—	3 13 9	6 6 10	—	—	3 6 11	5 2 3	6 6 10
June	"	9 0 0	3 13 9	6 6 10	9 13 9	9 13 9	6 0 0	5 2 3	6 6 10
July	"	10 4 7	4 4 7	6 0 0	—	—	5 2 3	5 9 1	—
August	"	8 9 2	5 9 1	9 6 10	—	6 13 8	5 2 3	7 11 5	—
Sept.	"	9 0 0	3 13 9	10 4 7	—	11 9 2	6 6 10	9 0 0	6 11 8
Oct.	"	9 6 10	5 2 3	11 9 2	—	12 0 0	6 13 8	6 6 10	—
Nov.	"	7 11 5	7 11 5	6 13 8	—	11 9 2	9 13 8	7 4 7	—
Deo.	"	—	4 11 5	4 4 7	13 4 6	11 2 3	—	9 13 8	—
Jan.	1941	—	4 11 5	6 0 0	13 4 6	12 0 0	—	5 2 3	5 2 3
Feb.	"	9 13 0	5 9 1	6 6 10	—	10 11 5	6 13 8	5 9 1	3 6 11
March	"	—	9 6 10	6 6 10	6 6 10	11 9 2	6 0 0	—	3 6 11
April	"	11 2 8	7 4 7	6 6 10	—	11 9 2	—	7 11 5	4 11 5

## XVI.

*the important inland markets of the Madras Province.  
maund.)*

S A B D I N E S.				J E W-F I S H E S.				
Malapalayam.	Paramakudi.	Kondithope.	Dowleshwaram.	Malapalayam.	Paramakudi.	Orathanad.	Kondithope.	Dowleshwaram.
Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.
5 2 3	5 2 3	—	—	—	—	6 13 8	8 2 3	6 13 8
16 11 5	3 13 9	—	—	—	—	6 13 8	—	10 4 7
5 9 1	5 9 1	10 4 7	8 9 2	—	6 6 10	10 4 7	—	9 13 8
5 2 3	6 0 0	—	13 4 6	—	7 11 5	5 9 1	—	13 4 6
—	6 6 10	—	9 6 10	—	2 9 2	5 2 3	—	8 9 2
4 4 7	7 11 5	—	6 6 10	—	7 11 5	6 0 0	8 2 3	6 6 10
6 6 10	8 9 2	—	9 13 9	11 9 2	3 13 9	5 9 1	—	7 4 7
6 6 10	12 13 8	—	16 4 7	10 4 7	—	6 13 8	—	7 11 5
3 13 9	11 9 2	—	6 13 8	13 11 4	—	5 2 3	8 2 3	6 0 0
5 2 3	9 0 0	—	8 2 3	—	3 6 11	6 6 10	—	6 6 10
3 13 9	6 0 0	—	6 6 10	—	7 11 5	5 2 3	8 2 3	5 2 3
3 13 9	6 6 10	—	6 6 10	11 9 2	7 4 7	5 2 3	8 2 3	6 6 10

Average wholesale prices of the main varieties of dried fish (soiled and/or unsoiled) in certain areas and markets.

Variety of fish.	Bombay city markets.	In produc- ing areas in Konkan.	* Dowlesh- waranad (East Godavari district).	* Orthanad (Tanjore district).	* Kondithe (Madras district).	* Paramakudi (Ramanad district).	* Malapala- yam (Tin- nevelly district).	Puri.	Calcutta.	Chittagong.
			Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.
lobrobranchs	•	•	10 11 2	7 3 5	—	5 7 11	9 6 9	—	—	—
fishes	•	•	—	5 3 10	6 4 9	—	6 2 7	10 14 1	—	—
Sardines	•	•	—	8 8 11	7 4 6	10 4 6	7 6 7	6 8 0	9 0 0	—
baa	•	•	—	9 15 6	5 12 6	—	7 2 11	5 9 11	9 0 0	13 8 0
shories	•	•	3 12 0	0 11 0	5 4 4	3 13 9	7 14 9	4 14 9	6 11 5	—
Baby Duck	•	•	11 4 0	9 0 0	7 11 4	8 15 11	—	7 14 8	—	9 8 0†
Indian salmon	•	•	18 0 0	—	6 11 4	11 11 8	10 7 11	7 10 1	7 7 11	—
fishes	•	•	14 0 0	9 4 0	7 13 3	6 4 0	8 2 3	5 13 4	11 12 6	—
Metas	•	•	40 8 0	—	7 11 4	—	—	6 15 3	7 7 7	8 8 0
anchets	•	•	14 8 0	—	10 14 1	—	8 2 3	6 10 3	10 10 8	—
•	•	•	19 4 0	12 8 0	12 12 10	8 3 6	—	8 12 6	14 11 1	—
storel	•	•	6 12 0	2 14 0	10 8 6	5 2 1	14 2 1	5 8 2	8 4 0	—
or other flat fish	•	•	—	—	11 2 1	7 0 11	—	—	—	—
awns (shelled)	•	•	22 8 0	6 12 0	—	—	10 6 5	—	7 0 0	16 0 0
awns (unshelled)	•	•	6 12 0	0 12 0	—	—	—	—	11 0 0	9 0 0
Dried, rohu & other freshwater fish	•	—	—	—	—	—	—	—	17 8 0	17 0 0
Miscellaneous	•	•	3 12 0	1 0 0	—	4 12 7	7 3 9	6 8 0	6 0 0	9 0 0

\* Wholesale markets in the Madras Province.

† Bombay Duck imported from Bombay Province sell at approximately double these rates.

**APPENDIX XVIII.**  
*Monthly prices of certain economic groups of fishes in three fishing areas of the Madras Province for the year 1938.*  
 (Per maund.)

## APPENDIX XIX.

Price spreads from producer to consumer in the marketing of fish.

(Figures in brackets show percentage of consumer's price.)

	1 maund of oil Sardine at Cannanore : Producer— Petty dealer— Consumer.	1 maund of salted cat-fish at Tanur : Producer— Assembling market— wholesaler— commission agent at Orthanad— Consumer in the adjoining villages.	Fresh Peekti : Producer at Khepu-para— Assembling market— Commission agent, Calcutta— Fish merchant, Delhi— Consumer.	1 maund of cured fish : Fish curing yard— N. Canara— Sewri— Hubli— Consumer.	Fresh fish : 12 maunds— Producer at Pattan Hotiana— Adatya at Lahore— Retail merchant— Consumer.
	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.
1. Producer's price at the landing ghat.	1 7 0 (74.2)	3 12 0* (43.7)	9 7 0† (30.2)	5 0 0‡ (46.1)	60 10 0 (47.5)
2. Handling and transport to curing establishment or assembling centre.	0 1 0 (3.2)	0 4 6 (3.3)	0 6 0 (1.2)	0 3 0 (1.7)	
3. Producer's price at assembling centre.	1 8 0 (77.4)	4 0 6 (47.0)	9 13 0 (31.4)	5 3 0 (47.8)	
4. Charges at assembling centre .	..	0 0 6 (0.3)		0 1 0 (0.6)	
5. Curing charges . . . .	..	0 7 6 (5.5)	8 6 0§ (26.8)	0 9 6 (5.5)	
6. Handling and cartage from assembling centre to railway station.	..	0 7 6 (5.5)		1 8 0¶ (13.8)	
7. Cost F. O. R. railway station at assembling centre.	..	5 0 0 (58.3)	21 3 3 (67.8)	7 5 6 (67.7)	
8. Railway freight . . . .	..	0 11 0 (8.0)	6 15 0 (22.2)	1 7 0 (13.3)	
9. Cost F. O. R. railway station at destination.	..	5 11 0 (66.3)	28 2 3 (90.0)	8 12 6 (81.0)	81 10 0 (64.0)
10. Handling and transport charges from railway station to commission agent's place of business.	..	0 2 9 (2.0)	0 4 0 (0.8)	0 3 0 (1.8)	..
11. Charges paid for sale at destination.	..	1 5 0 (15.3)	0 2 0   (0.4)	0 2 0 (1.3)	4 4 0 (3.3)
12. Price at commission agent's premises.	..	7 2 9 (83.6)	28 8 3 (91.2)	9 1 6 (84.0)	85 14 0 (67.3)
13. Cost at retail merchant's shop .	..	7 7 3 (86.0)	28 8 3 (91.2)	9 10 6 (89.0)	92 9 0 (72.6)
14. Retailer's margin . . .	0 7 0 (22.6)	1 2 0 (13.1)	2 12 0 (8.8)	1 3 0 (11.0)	34 15 0 (27.4)
15. Consumer's price . . .	1 15 0 (100)	8 9 3 (100)	31 4 3 (100)	10 13 6 (100)	127 8 0 (100)

\* Cost of 1 3/5 maunds of fresh fish to allow for dryage and wastage.

† Cost of 25 seers of fish.

‡ Cost of 1 1/2 maunds of fresh fish.

§ Includes Rs. 1.12.0 railway freight from Khepupara to Sealdah, cost of ice, wholesaler's margin, commission agent's margin, transport from Sealdah to wholesaler, thence to commission agent's premises, re-packing, icing and transport to Howrah.

|| Terminal tax.

¶ Sent by country craft to Haji Bunder; includes Bombay Port Trust dues @ Rs. 1.12.0 per ton.

## APPENDIX XX.

## INDIAN FISHERIES ACT.

(Act No. IV of 1897.)

An Act to provide for certain matters relating to Fisheries in British India.

WHEREAS it is expedient to provide for certain matters relating to fisheries in British India; it is hereby enacted as follows:—

1. (1) This Act may be called the Indian Fisheries Act, 1897;
- (2) It extends to the whole of British India, except Burma; and
- (3) it shall come into force at once.

2. Subject to the provisions of sections 8 and 10 of the General Clauses Act, 1887, this Act shall be read as supplemental to any other enactment for the time being in force relating to fisheries in any part of British India except Burma.

3. In this Act, unless there is anything repugnant in the subject or context,—

- (1) fish includes shell-fish;
- (2) "fixed engine" means any net, cage, trap or other contrivance for taking fish, fixed in the soil or made stationary in any other way; and

(3) "Private water" means water which is the exclusive property of any person, or in which the person has for the time being an exclusive right of fishery whether as owner, lessee or in any other capacity.

*Explanation* :—Water shall not cease to be "private water" within the meaning of this definition by reason only that other persons may have by custom a right of fishery therein.

4. (1) If any person uses any dynamite or other explosive substance in any water with intent thereto to catch or destroy any of the fish that may be therein, he shall be punishable with imprisonment for a term which may extend to two months, or with fine which may extend to two hundred rupees.

(2) In sub-section (1) the word "water" includes the sea within a distance of one marine league of the sea-coast; and an offence committed under that sub-section in such sea may be tried, punished and in all respects dealt with as if it had been committed on the land abutting on such coast.

5. (1) If any person puts any poison, lime or noxious material into any water with intent thereto to catch or destroy any fish, he shall be punishable with imprisonment for a term which may extend to two months, or with fine which may extend to two hundred rupees.

(2) The Local Government may, by notification in the official Gazette, suspend the operation of this section in any specified area, and may in like manner modify or cancel any such notification.

6. (1) The Local Government may make rules for the purposes hereinafter in this section mentioned, and may by a notification in the official Gazette apply all or any of such waters, not being private waters, as the Local Government may specify in the said notification.

(2) The Local Government may also by a like notification, apply such rules of any of them to any private water with the consent in writing of the owner thereof and of all persons having for the time being any exclusive right of fishery therein.

(3) Such rules may prohibit or regulate all or any of the following matters, that is to say,—

- (a) the erection and use of fixed engines;
- (b) the construction of wires; and
- (c) the dimension and kind of the nets to be used and the modes of using them.

(4) Such rules may also prohibit all fishing in any specified water for a period not exceeding two years.

(5) In making any rule under this section the Local Government may—

(a) direct that a breach of it shall be punishable with fine which may extend to one hundred rupees; and, when the breach is a continuing breach, with a further fine which may extend to ten rupees for every day after the date of the first conviction during which the breach is proved to have been persisted in; and

(b) provide for—

(i) the seizure, forfeiture and removal of fixed engines erected, or used, or nets used, in contravention of the rule, and

(ii) the forfeiture of any fish taken by means of any such fixed engine or net.

(6) The power to make rules under this section is subject to the condition that they shall be made after previous publication.

7. (1) Any Police-officer, or other person specially empowered by the Local Government in this behalf, either by name or as holding any office, for the time being, may, without an order from a Magistrate and without warrant, arrest any person committing in his view any offence punishable under section 4 or 5 or under any rule under section 6—

(a) if the name and address of the person are unknown to him, and (b) if the person declines to give his name and address, or if there is reason to doubt the accuracy of the name and address if given.

(2) A person arrested under this section may be detained until his name and address have been correctly ascertained.

Provided that no person so arrested, shall be detained longer than may be necessary for bringing him before a Magistrate, except under the order of a Magistrate for his detention.

#### GLOSSARY.

##### A

*Adatya*.—Commission agent.

*Anadromous*.—Ascending rivers from the sea, at certain seasons for breeding purposes.

##### B

*Bacteria*.—One-celled micro organisms which cause among other things decomposition of dead animal matter.

*Bahardar*.—Leader of a party.

*Bahangi*.—A pole, the ends of which are connected by rope to a flat contrivance for carrying loads, the pole being balanced on the shoulder.

*Blanching*.—Scalding.

*Brine*.—A strong saline solution generally of common salt.

##### C

*Chapatti*.—Unleavened bread made in thin flat cakes.

*Chadu*.—Same as *Takli*.

*Cable*.—A flat-bottomed fishing boat.

*Crystalloid*.—A substance which, in solution, diffuses readily through animal membranes and is capable of being crystallised.

##### D

*Dhobi*.—Washerman.

##### E

*Euzymes*.—Complex organic substances that accelerate specific transformations of material ferments.

##### F

*Filleting*.—Removal of bones and sometimes skins also. The round fish when made into fillets are eviscerated, beheaded and split down both sides of the backbone, each fish thus yielding two fillets.

##### G

*Gamla*.—Large earthen vessel.

*Ghat*.—A platform jutting into the water.

*Glazing*.—To over-lay with a thin surface coating of ice, in the case of frozen fish, to prevent desiccation. This is usually done by dipping frozen fish in ice-cold water and removing when the moisture adhering to the fish freezes.

##### H

*Hat*.—A periodical market.

*Hisabana*.—A market charge levied for the services of an accountant.

##### J

*Jhils*.—Shallow inland lakes.

*Kols*.—Shallow tanks.

## M

*Mahajan*.—A money-lender.

*Mandy*.—A wholesale market.

*Munim*.—Clerk, Accountant.

*Munj*.—A kind of dried grass out of which ropes are made.

## P

*Peshkash*.—A sum paid by an Indian chief for enjoying certain crown rights.

*Pilchi*.—A kind of elastic twig out of which baskets are made.

*Puja*.—Hindu worship.

## R

*Rabbeted*.—A grove cut out of the edge or face of a piece of wood to receive another piece similarly treated. The two pieces are united at the edges.

*Rigor*.—*Rigor mortis*, the rigidity of muscles that occurs at death.

## S

*Sahukar*.—A money-lender.

*Self-brine*.—The saline solution impregnated with tissue fluids which exudes from a stack of dry-salted fish. Moisture is withdrawn from the cells by osmosis and the salt dissolves in the expressed fluids.

*Shandy*.—Same as *hat*.

*Shola*.—A kind of reed whose interior is filled with pith.

## T

*Takli*.—A spindle with a heavy weight attached to the bottom used for twisting fibrous materials or yarn into strings.

*Taint*.—Spoilage.

*Thatties*.—A mat made generally of thin wafers of split bamboo.

## V

*Viss*.—A unit of weight in retail trade in Madras equivalent to 3 lb.



## List of publications issued by the Agricultural Marketing Adviser to the Government of India—contd.

MARKET- ING SERIES NO.	SYMBOL NO.	NAME OF PUBLICATION.	PRICE.
39.	AMA. 23	Report on the Marketing of Sugar in India and Burma . . . . .	Rs. 1-4-0 or 2s.
40.	AMA. 39	Report on the Marketing of Skins in India and Burma . . . . .	Rs. 1-4-0 or 2s.
41.	AMA. 22/2	Second edition of the Report on the Marketing of Milk in India and Burma . . . . .	Rs. 1-4-0 or 2s.
42.	AMA. 36	Report on Co-operative Agricultural Marketing in India . . . . .	Rs. 1-4-0 or 2s.
43.	AMA. 42	Report on the Marketing of Citrus Fruits in India . . . . .	Rs. 1-4-0 or 2s.
44.	AMA. 33	Report on the Marketing of Lac in India . . . . .	Rs. 1-4-0 or 2s.
45.	AMA. 40	Report on Fairs, Markets and Produce Exchanges in India . . . . .	Rs. 1-4-0 or 2s.
46.	AMA. 32	Report on the Marketing of Coconuts and Coconut Products in India . . . . .	Rs. 1-4-0 or 2s.
47.	AMA. 45	Report on the Marketing of Cashew Nuts in India . . . . .	Rs. 1-4-0 or 2s.
48.	AMA. 43	Report on the Marketing of Gram in India . . . . .	Rs. 1-4-0 or 2s.
49.	AMA.	Report on the Marketing of Bananas in India . . . . .	Rs. 1-4-0 or 2s.
50.	AMA.	Report on the Marketing of Sheep and Goats in India . . . . .	Rs. 1-4-0 or 2s.
51.	AMA. 44	Report on the Marketing of Barley in India . . . . .	Rs. 1-4-0 or 2s.
52.	AMA. 46	Report on the Marketing of Fish in India . . . . .	Rs. 1-4-0 or 2s.
AMA.		Report on the Marketing of Cattle in India . . . . .	..
AMA.		Report on the Marketing of Rapeseed and Mustard in India (Under print) . . . . .	..

*N.B.*—Prices are inclusive of packing and postage (in India). Indentors requiring the above are requested to quote only the symbol and not the title of the publication.

Publications noted above can be had from (a) Manager of Publications, Civil Lines, Delhi, (b) Book Depot, 8, Hastings Street, Calcutta (for local cash sale only) and (c) any of the authorised agents for the sale of Government of India publications.

*In Europe and America.*—Public Department (Publications Branch), Office of the High Commissioner for India, India House, Aldwych, London, W. C. 2.





